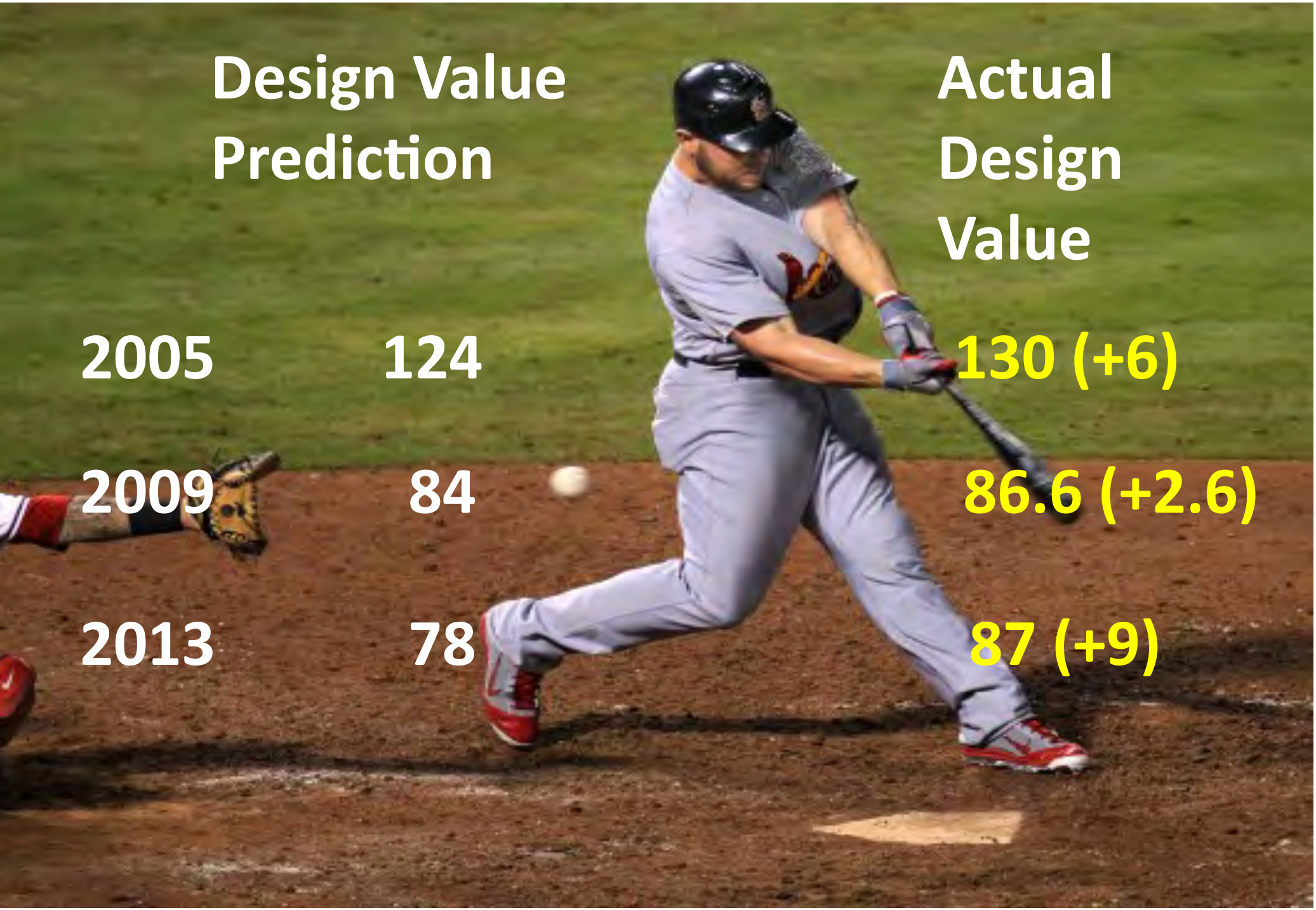
“The photochemical modeling indicates the DFW area will attain the 1997 eight-hour ozone standard and additional control measures are not necessary for the area to demonstrate attainment by the attainment date.”

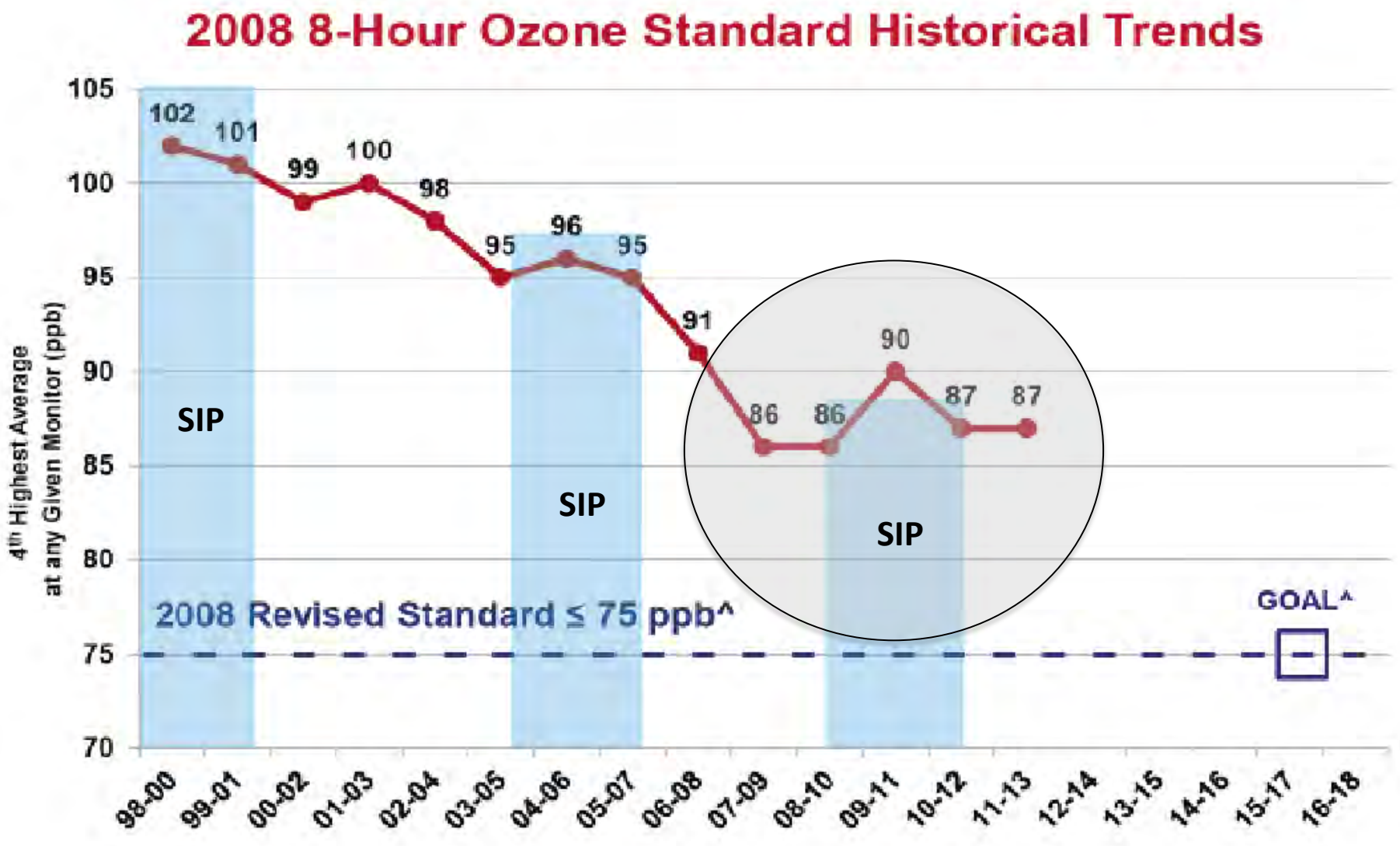

But some of us want insurance….
PLAN A
PLAN B

TCEQ's Batting Avg is .000

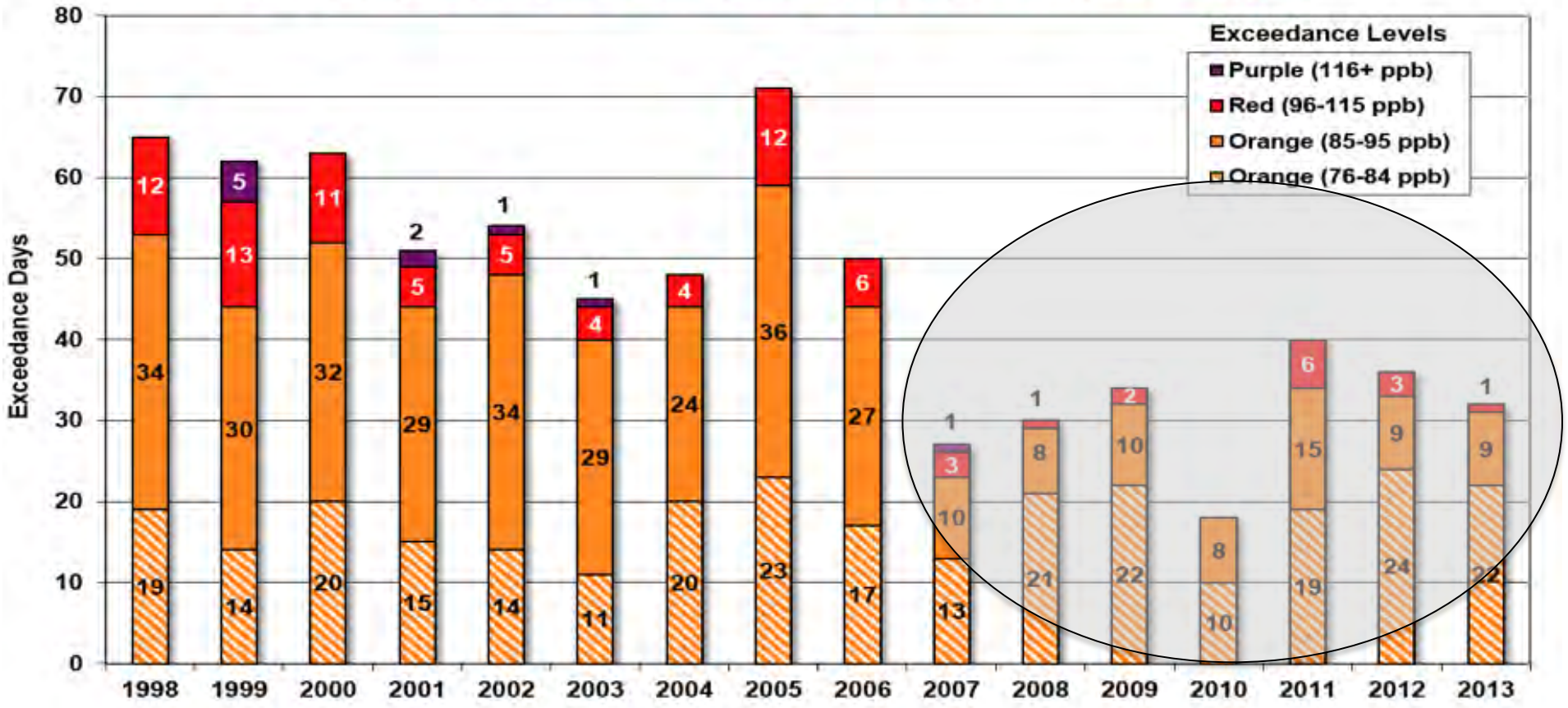
YEAR	GOAL	RESULT
1991	Attainment by 1996	Fail
1998	Attainment by 1999	Fail
2000	Attainment by 2005	Fail
2007	Attainment by 2009	Fail
2011	Attainment by 2013	Fail

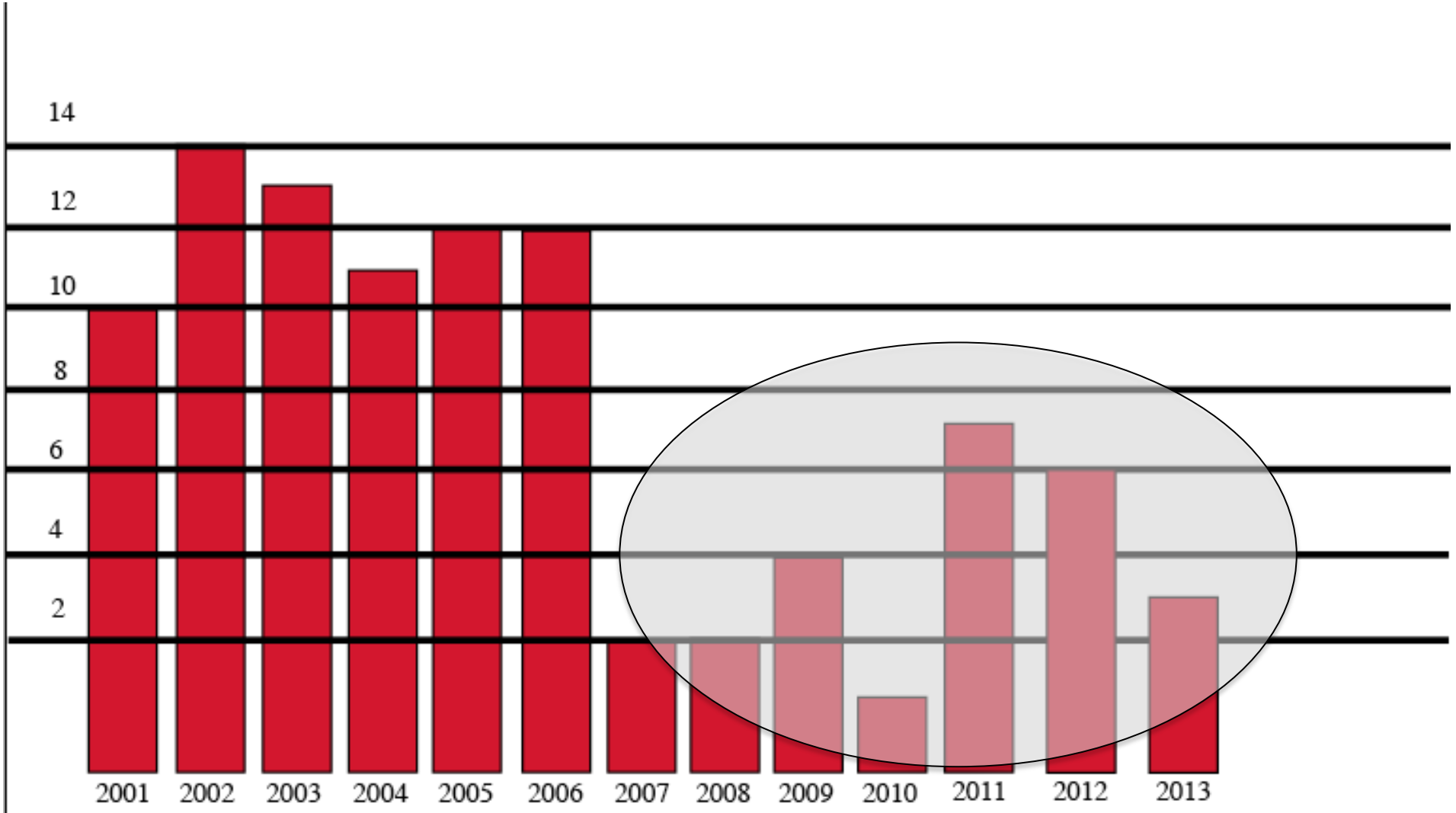

Design Value Prediction
Actual Design Value
2005
124
130 (+6)
2009
84
86.6 (+2.6)
2013
78
87 (+9)

DFW AIR QUALITY BETTER? Not Since 2007….



8-Hour Ozone Standard Exceedance Days



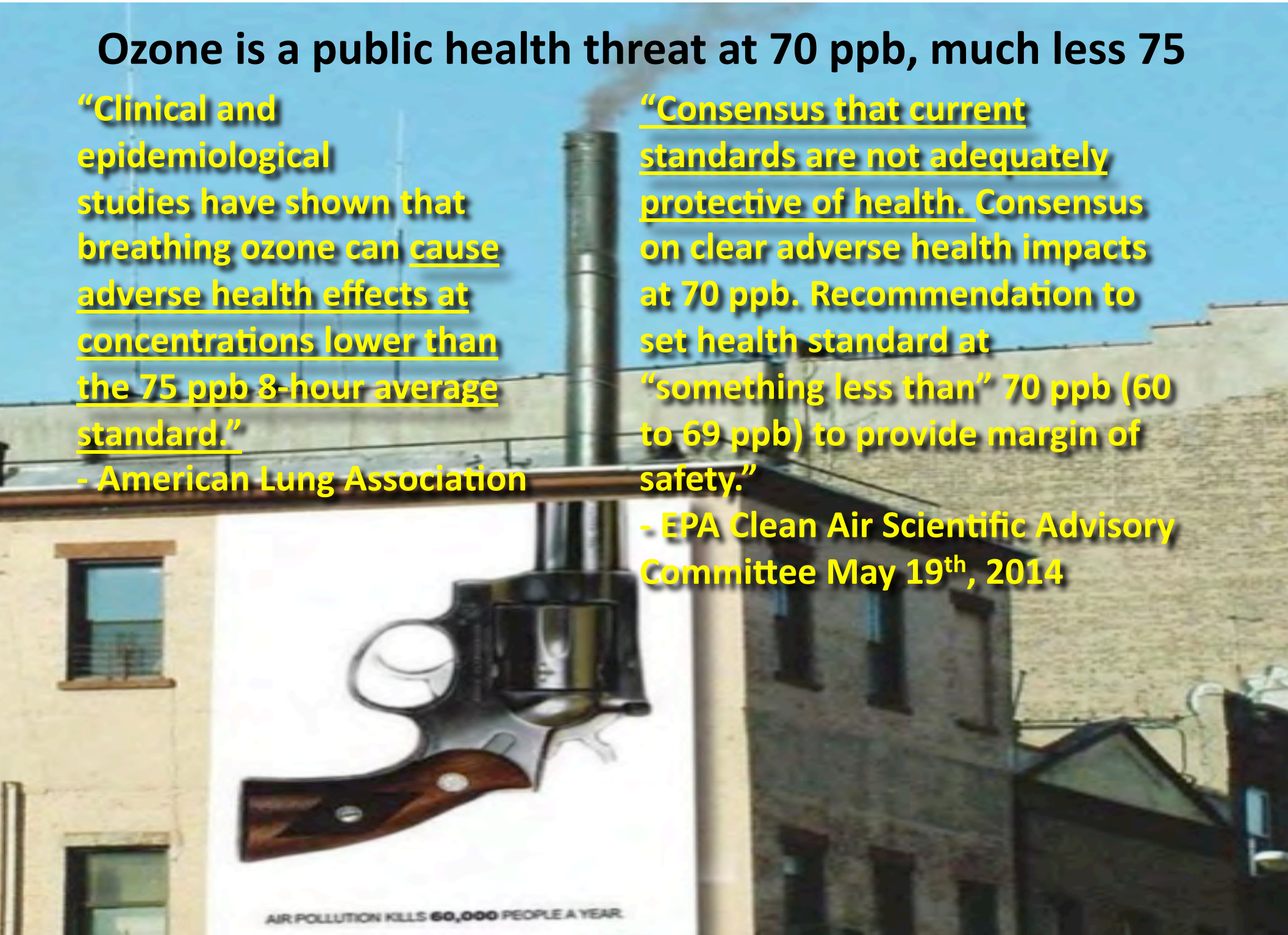


Number of DFW Air Monitors in Official Violations of 1997 85 ppb Ozone Standard 2001- 13

Ozone is a public health threat at 70 ppb, much less 75

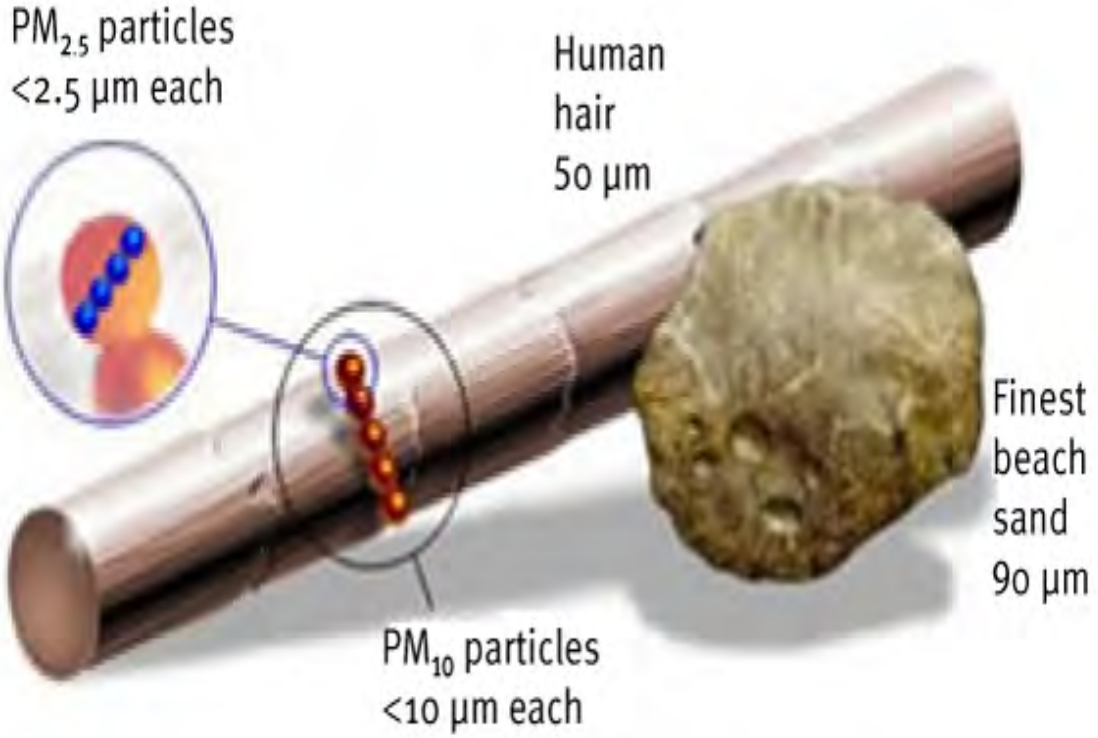
"Clinical and epidemiological studies have shown that breathing ozone can cause adverse health effects at concentrations lower than the 75 ppb 8-hour average standard."
- American Lung Association

"Consensus that current standards are not adequately protective of health. Consensus on clear adverse health impacts at 70 ppb. Recommendation to set health standard at "something less than" 70 ppb (60 to 69 ppb) to provide margin of safety."
- EPA Clean Air Scientific Advisory Committee May 19th, 2014



Reducing ozone pollution leads to reductions of other kinds of air pollution

Particulate Matter Pollution



"Overwhelming evidence shows that particle pollution can kill. Particle pollution can increase the risk of heart disease, lung cancer and asthma attacks and can interfere with the growth and work of the lungs."

- American Lung Association

But TCEQ's "Close Enough" approach leaves 4 monitors above 75 ppb in 2018 *AFTER* modeling.

Denton	**77.6**
Eagle Mt Lake	**76.4**
Grapevine	**76.3**
Keller	**75.37**
Wise Co	**?**

DÉJÀ VU All OVER AGAIN:
In 2007, 4 monitors were *<u>also</u>* above the standard *AFTER* modeling.

Frisco C31	**88**
Dallas Hinton C60	**86**
Denton C56	**88**
Fort Worth NW C13	**85**

"I'm advised that your modeling predicts four monitors would exceed the attainment level in 2009 under the new plan….I am concerned by these reports and worry that the SIP may not be approvable."

(Bush Administration) EPA Regional Administrator Richard Greene
May 23rd, 2007

EPA: Tarrant County STILL in violation AFTER Low-Sulfur Gas Introduced

(From: EPA's Tier 3 air quality modeling technical support document)

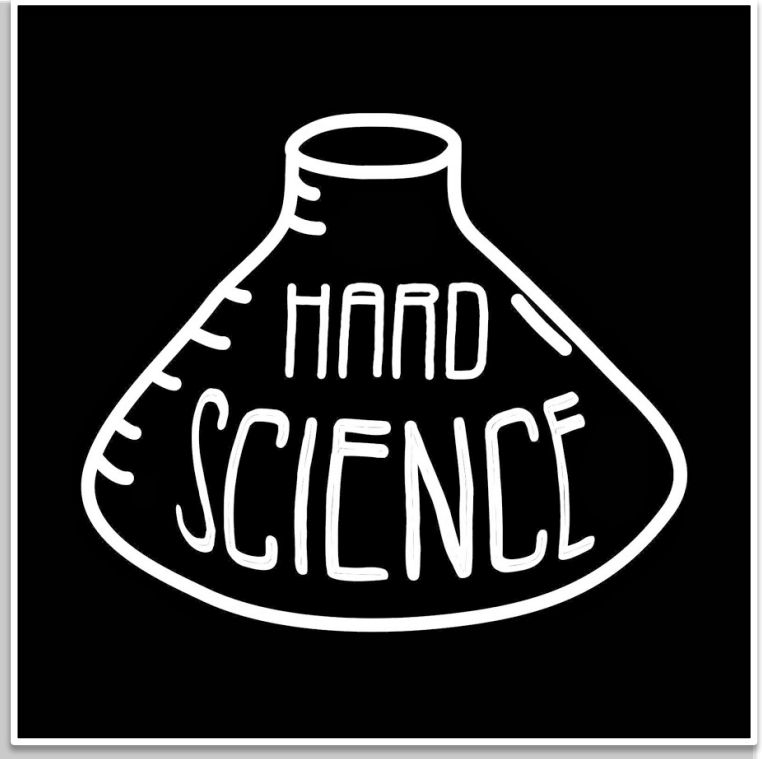
"The maximum projected decrease in an 8-hour ozone design value in 2017 is 1.09 ppb in Tarrant County, Texas, near Dallas, ***which is projected to be above the ozone standard." (76.2ppb)***

BTW – This is how that sentence was represented by TCEQ in its first presentation to the Technical Committee last November:

"The maximum projected decrease in an eight-hour ozone design value in 2017 is 1.09 ppb in Tarrant County, Texas…"

“Close Enough” Relies on “Weight of Evidence”

What’s SUPPOSED to be In the Weight of Evidence Category?



“Corroborative Analysis” to support the predictions of the computer modeling.

“Absolute” modeling analysis is best evidence.

Each type of analysis should have a quantifiable and identified outcome that contributes to meeting the standard.

What TCEQ's Really Uses in its Weight of Evidence Category

"Sustainable Development"

"Arterial/Freeway Bottleneck Program"

"Truck Lane Restriction Program"

"Pay-As-You-Drive Insurance Program"

"Control Strategy Catalog Review"

"Air Quality Marketing and Outreach"

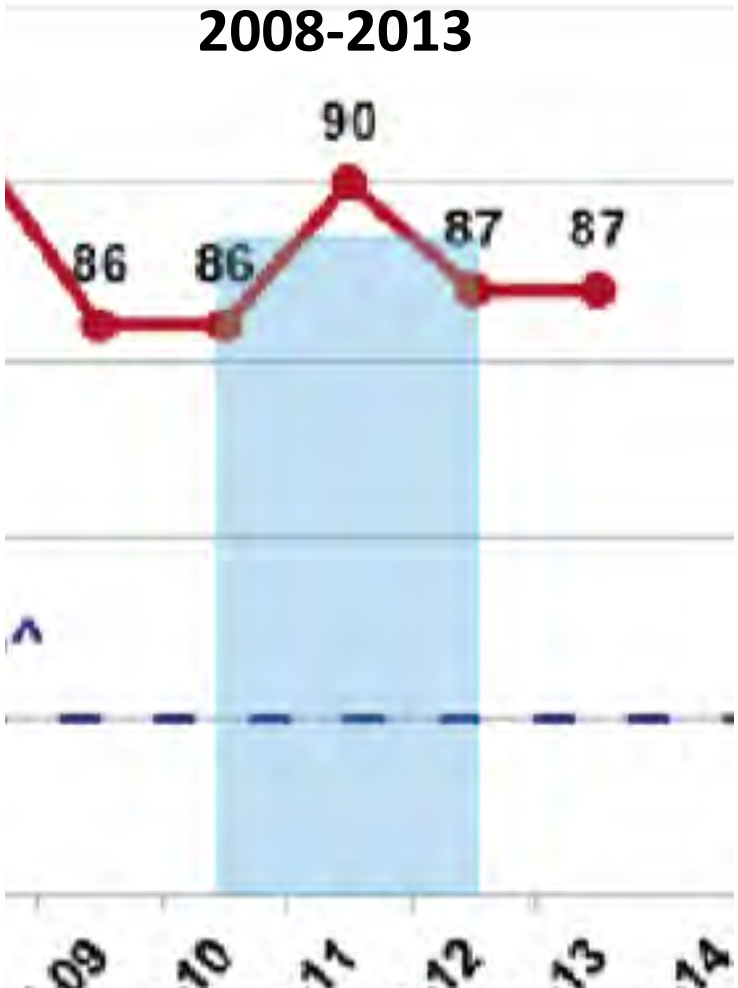
A catch-all, mash-up of measures that are difficult, if not impossible to quantify.

Weight of Evidence: Total Ozone Trends

Figure 3-1 of the Submitted SIP shows that design values in DFW were virtually flat during the 1998 to 2003 time period, and actually increased slightly from 98 to 99 ppb. The 23% reduction in known NOx emissions in DFW during this time period were completely insufficient to produce any reduction in measured ozone design values.

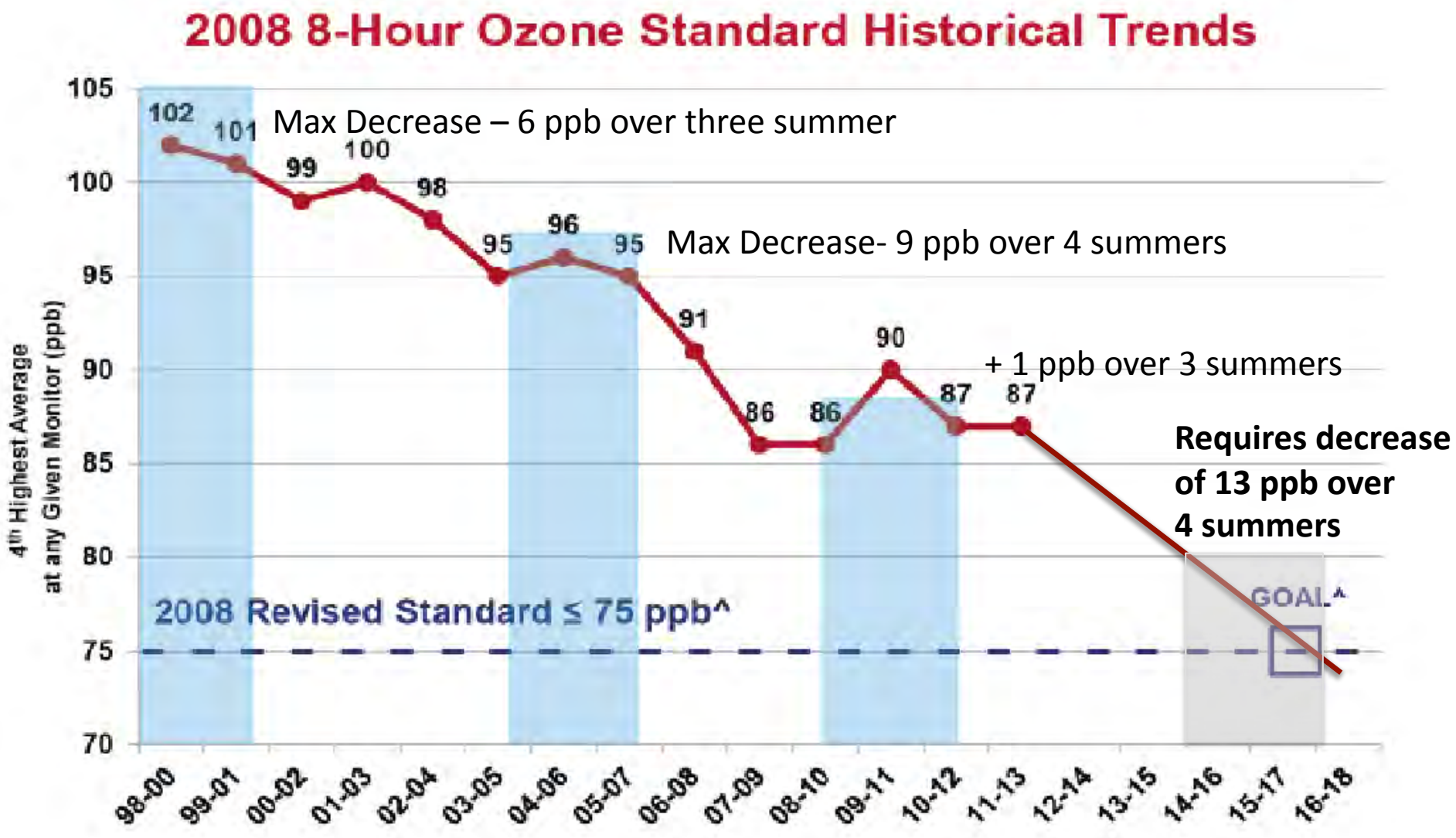
1998-2003

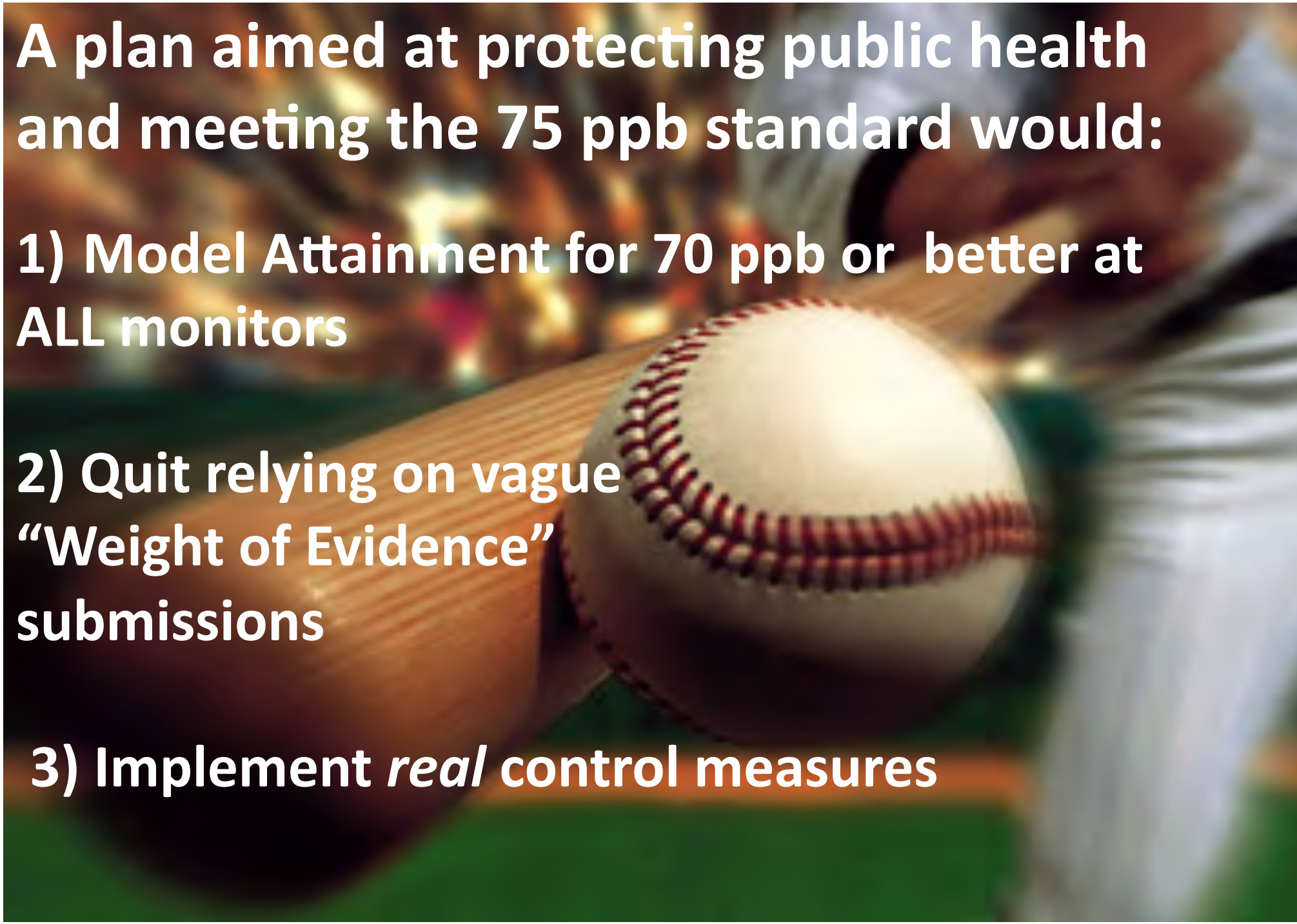
2008-2013




“Close Enough” and Weight of Evidence in 2000
FAIL
Close Enough” and Weight of Evidence in 2007
FAIL
Close Enough” and Weight of Evidence in 2011
FAIL

Can We Expect TCEQ's Weight of Evidence Approach to Work Now?




A plan aimed at protecting public health and meeting the 75 ppb standard would:
1) Model Attainment for 70 ppb or better at ALL monitors
2) Quit relying on vague "Weight of Evidence" submissions
3) Implement *real* control measures

"RACM" - Reasonably Available Control Measures

The CAA requires nonattainment plans to provide for implementation of all **reasonably available control measures** (RACM) "**as *expeditiously as practicable***." 42 U.S.C. 7502(c)(1).

TCEQ is supposed to consider ALL available control measures, and to adopt and **implement any such measures that are reasonably available.** 57 FR 13498, 13560 (1992).

To show that RACM are being implemented as expeditiously as practicable, the State must explain **why the selected implementation schedule is the earliest schedule based on the specific circumstances of that area.**

Such claims cannot be general claims that more time is needed but rather should be ***specifically grounded in evidence of economic or technologic infeasibility.***

APPYING “SMART” RACM to 2018 PLAN

Control Measures that…

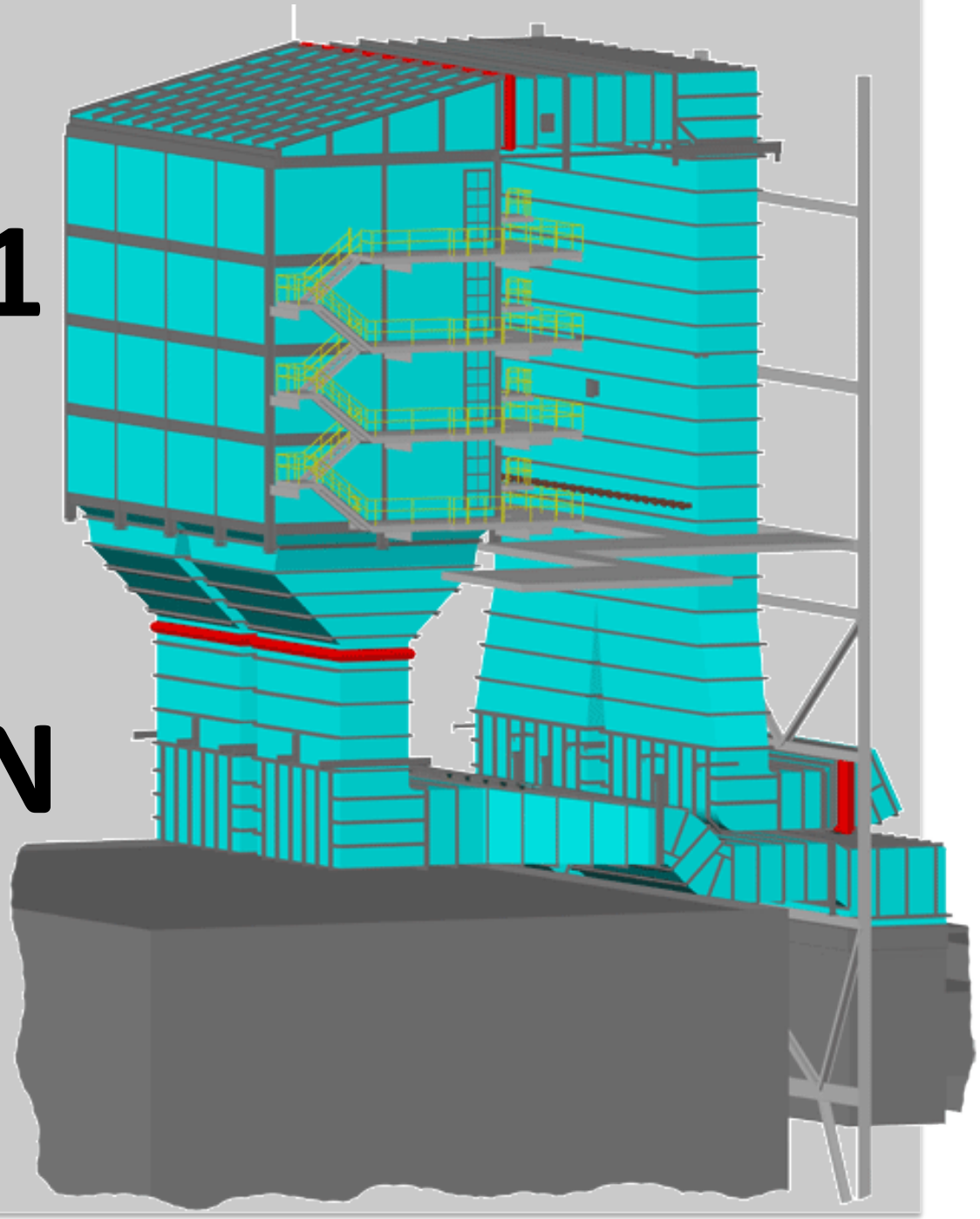
- **Have the largest reductions on the most stubborn monitors**
- **Are available with current technology**
- **Have the largest co-benefits**

Tarrant and Denton County monitor sites have ALWAYS been the most stubborn…..

Year	Monitor with Highest DV	County
1999	Frisco	Collin
2000	Denton	Denton
2001	Denton	Denton
2002	Denton	Denton
2003	Keller	Tarrant
2004	Keller	Tarrant
2005	Ft. Worth NW	Tarrant
2006	Eagle Mt Lake	Tarrant
2007	Eagle Mt. Lake	Tarrant
2008	Denton	Denton
2008	Eagle Mt. Lake	Tarrant
2009	Keller	Tarrant
2010	Keller	Tarrant
2011	Keller	Tarrant
2012	Denton	Denton

RACM STRATEGY #1

SCR on MIDLOTHIAN CEMENT KILNS

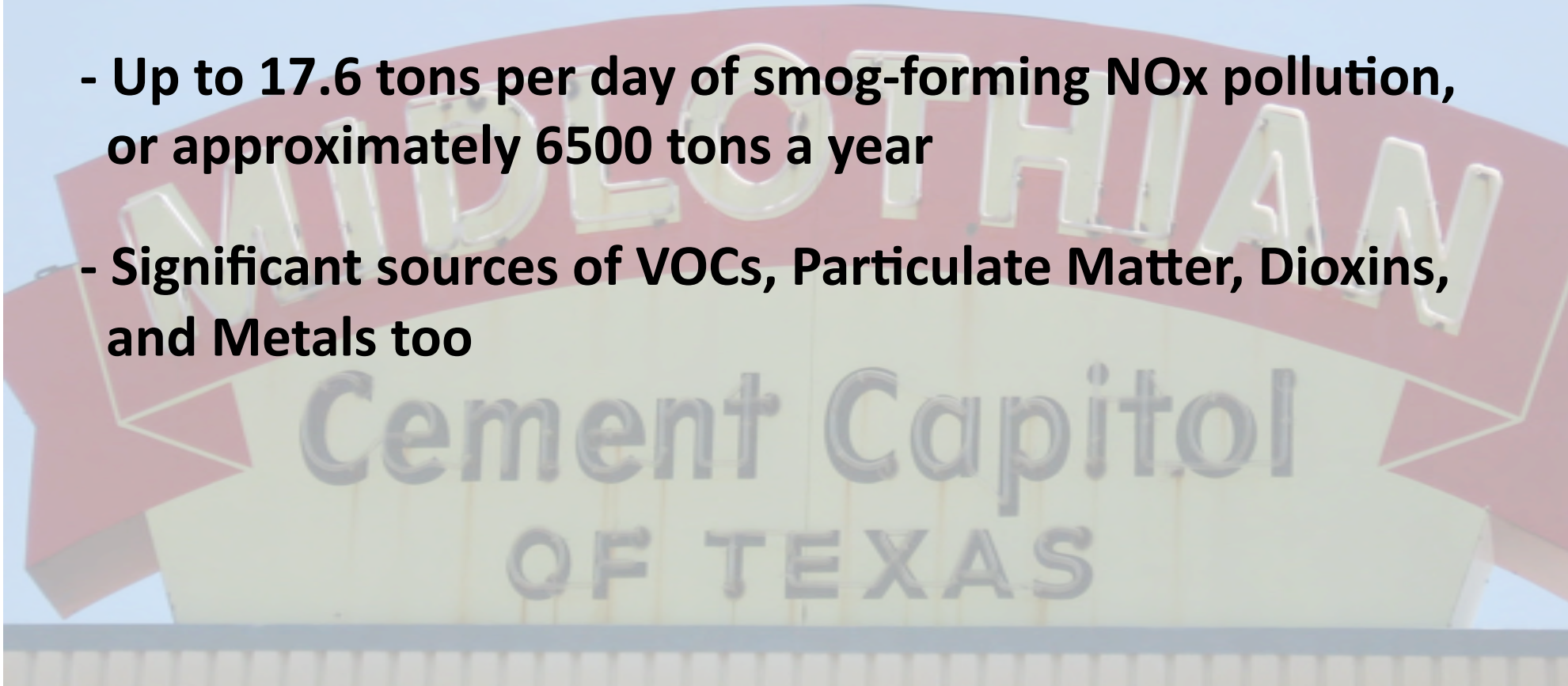


The Three Midlothian Cement Kilns Have Been, and Remain, the Single Largest Sources of Air Pollution in North Texas

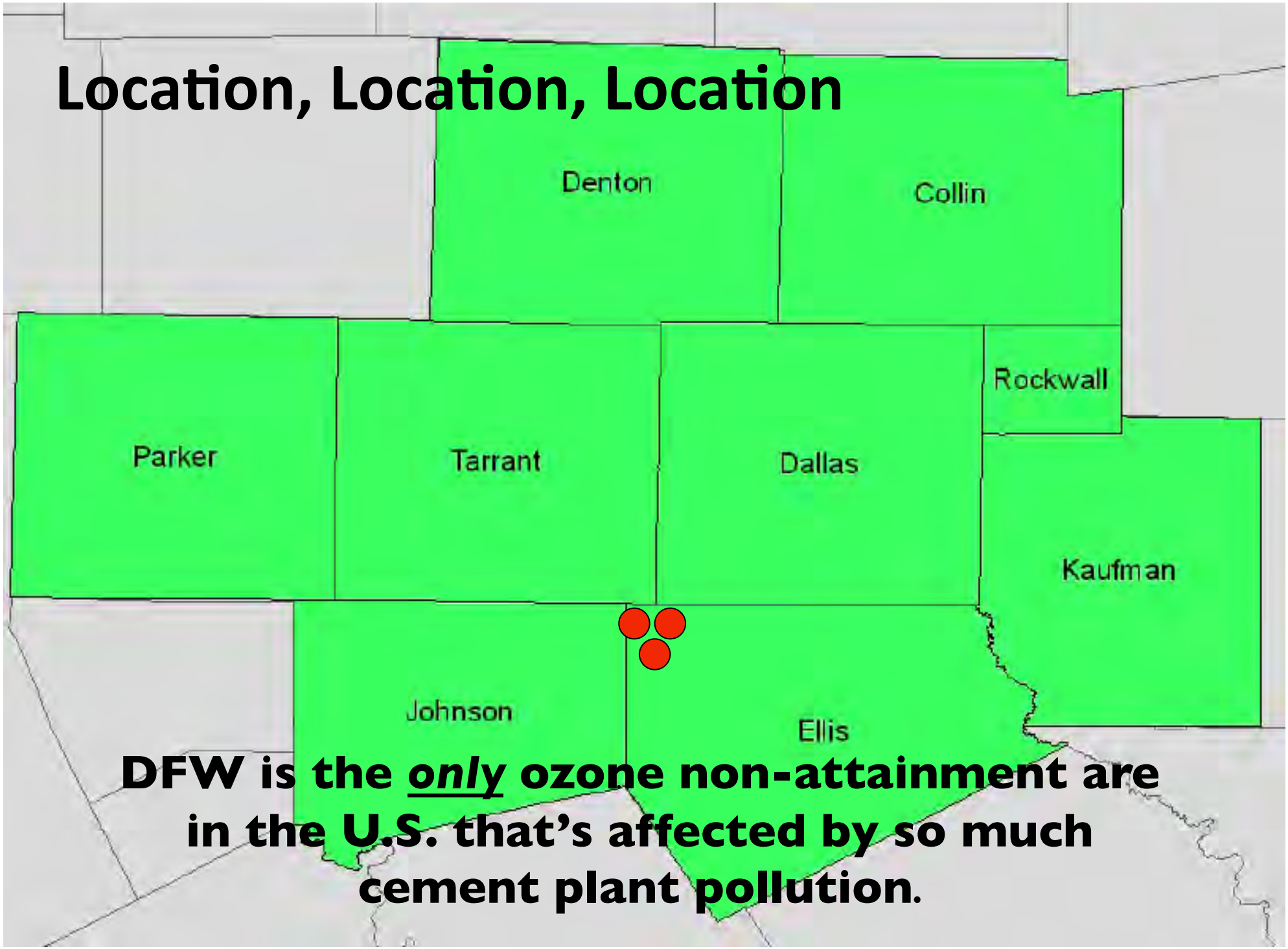
-Largest Concentration of Cement Manufacturing in the US

- Up to 17.6 tons per day of smog-forming NOx pollution, or approximately 6500 tons a year

- Significant sources of VOCs, Particulate Matter, Dioxins, and Metals too

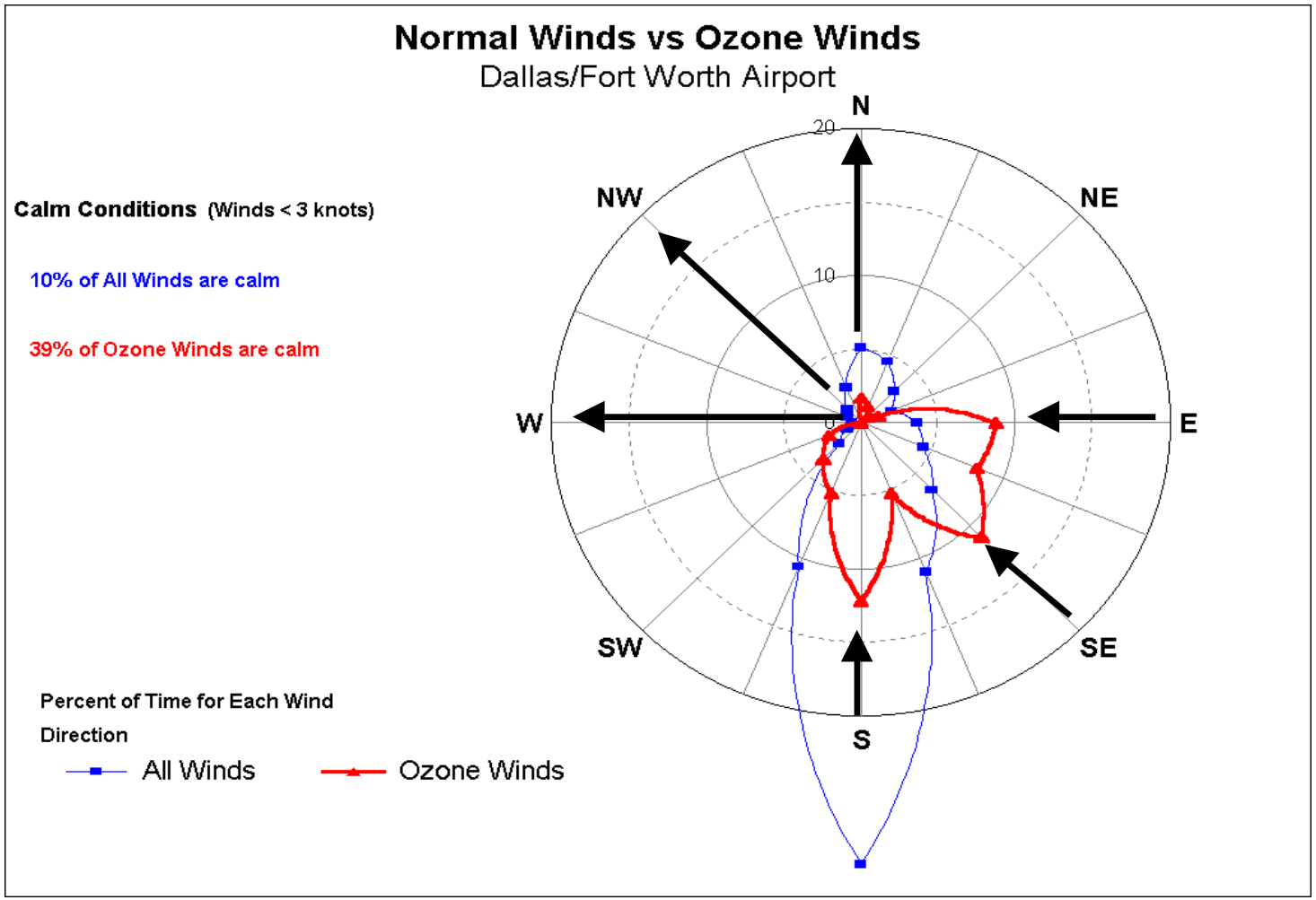


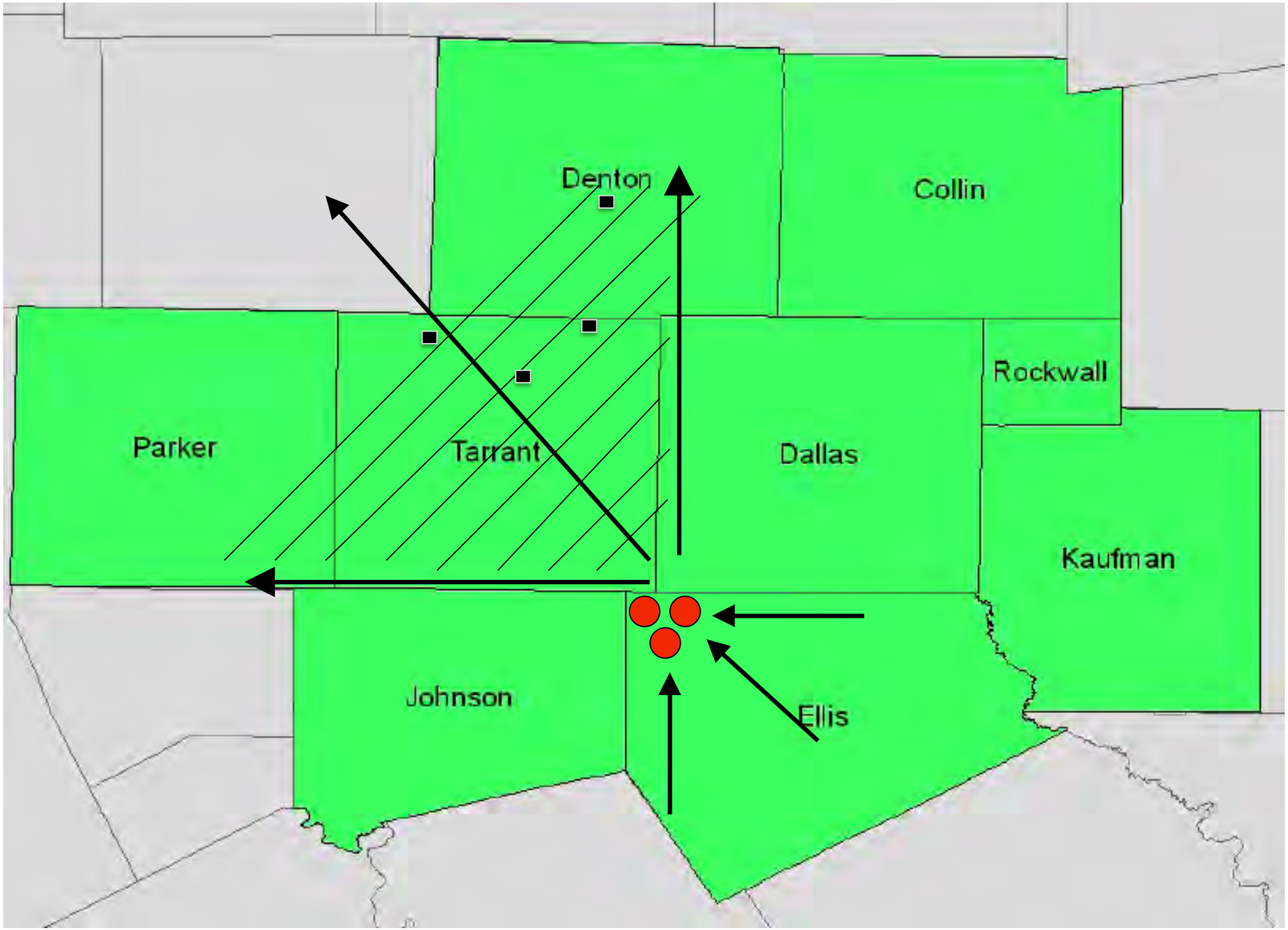
Location, Location, Location



DFW is the *only* ozone non-attainment are in the U.S. that's affected by so much cement plant pollution.

Prevailing winds in Ozone Season create a "9 to 12" area of fallout in DFW




Denton
Collin
Parker
Tarrant
Dallas
Rockwall
Kaufman
Johnson
Ellis

1999-2000 SIP:

"A list of possible recommendations includes reducing nitrogen oxide emissions from the Ellis County cement kilns by 30 percent. But Bill Jordan, a spokesman with the Texas Natural Resources Conservation Commission, said the benefits of reducing ozone by doing that are negligible, and there would be more benefits through tougher vehicle emissions tests and the construction time limit."

1996-1998 - Slip Stream Tests for SCR on Cement Kilns in Germany, Austria, Sweeden and Italy

SCR TIMELINE

1999-2000 SIP

However State modeling showed "significant health benefits from a 50% or more reduction from kiln emissions, translating into a 9 to 12 ppb drop in peak ozone levels and a 1-4 ppb drop in the four "core counties"

North Texas Clean Air Steering Committee *recommendation* for reduction in Midlothian cement plant emissions:

50%

***Actual* cut included in SIP:**

18.5%

2003-2004 Mid-Course SIP Correction:

According to the TNRCC, "Application of SCR at cement kilns was found to be problematic due to high concentration of particulate matter in the exhaust gas stream. This leads to catalyst fouling, causing high pressure drops and reduced catalyst activity."

1996-1998 - Slip Stream Tests for SCR on Cement Kilns in Germany, Austria, Sweeden and Italy

SCR TIMELINE

2001: Full Scale application of SCR on Solnhofen Germany cement Kiln

2005 TCEQ KILN STUDY:

Mandated by court settlement with environmental groups over the failure of the 2000 SIP. Prepared by Eastern Research Group for TCEQ. Authors were five cement kiln experts.

Conclusions:

1) **"SCR is an available technology for dry kilns, i.e. "commercially available and in use on similar types of cement plants" and transferable technology, i.e. "used on similar processes and could be expected to work" on wet kilns.**

2) **SCR makes 80-85% reductions of smog-forming NOx possible.**

3) **Cost is under $2000 per ton of NOx removed in dry kilns, to $5,000 per ton in wet kilns (vs. Up to $13,000 per ton/TERP)**

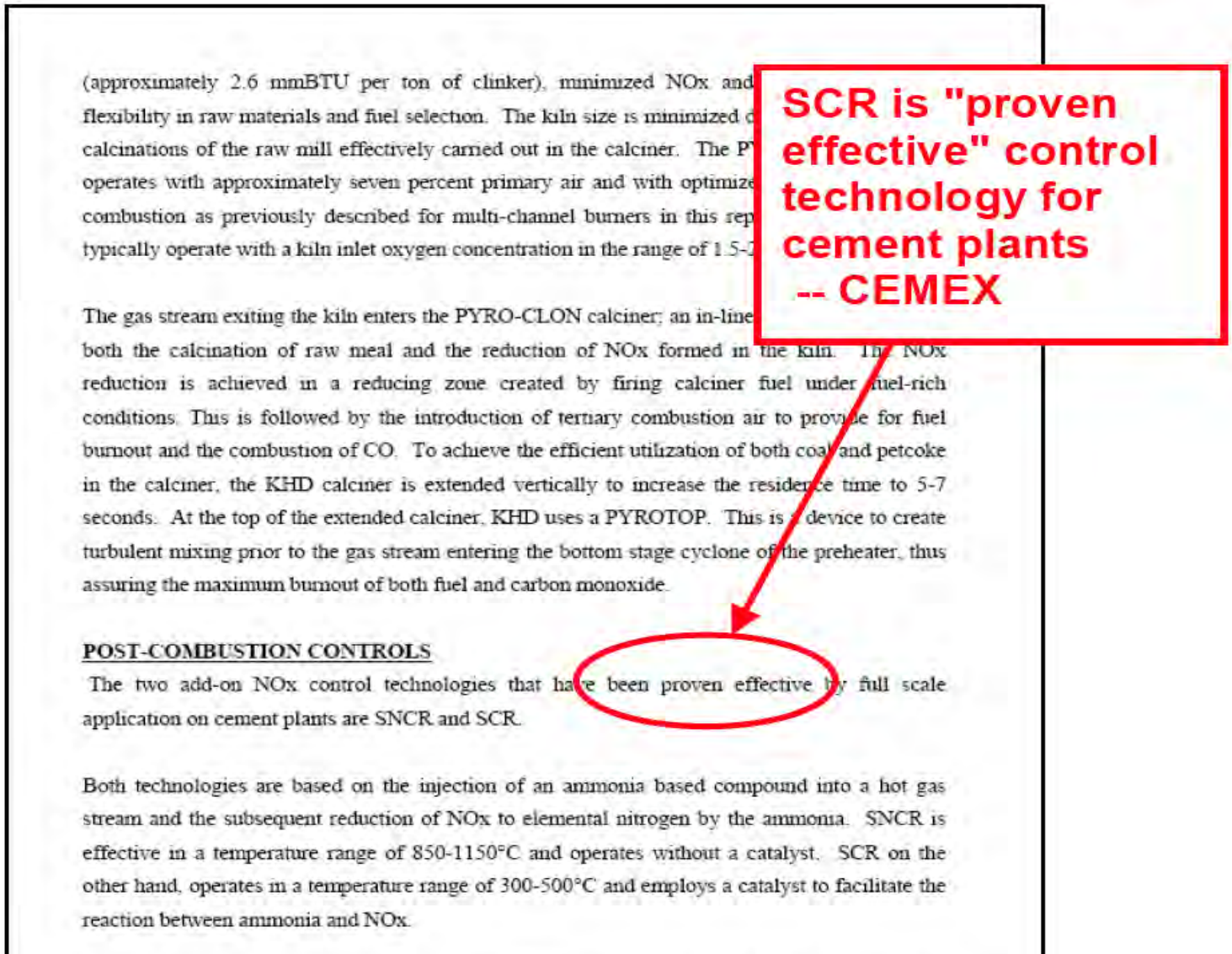
2006: American Cement Manufacturer Endorses SCR as "Proven Effective" Control Technology for Cement Plants

APPLICATION FOR A PSD CONSTRUCTION PERMIT REVIEW CEMEX, INC

.

Kiln 3 Project Brooksville Cement Plant Hernando County, Florida

October 12, 2006



(approximately 2.6 mmBTU per ton of clinker), minimized NOx and
flexibility in raw materials and fuel selection. The kiln size is minimized d
calcinations of the raw mill effectively carried out in the calciner. The PY
operates with approximately seven percent primary air and with optimize
combustion as previously described for multi-channel burners in this rep
typically operate with a kiln inlet oxygen concentration in the range of 1.5-2

The gas stream exiting the kiln enters the PYRO-CLON calciner; an in-line
both the calcination of raw meal and the reduction of NOx formed in the kiln. The NOx
reduction is achieved in a reducing zone created by firing calciner fuel under fuel-rich
conditions. This is followed by the introduction of tertiary combustion air to provide for fuel
burnout and the combustion of CO. To achieve the efficient utilization of both coal and petcoke
in the calciner, the KHD calciner is extended vertically to increase the residence time to 5-7
seconds. At the top of the extended calciner, KHD uses a PYROTOP. This is a device to create
turbulent mixing prior to the gas stream entering the bottom stage cyclone of the preheater, thus
assuring the maximum burnout of both fuel and carbon monoxide.

POST-COMBUSTION CONTROLS

The two add-on NOx control technologies that have been proven effective by full scale application on cement plants are SNCR and SCR.

Both technologies are based on the injection of an ammonia based compound into a hot gas stream and the subsequent reduction of NOx to elemental nitrogen by the ammonia. SNCR is effective in a temperature range of 850-1150°C and operates without a catalyst. SCR on the other hand, operates in a temperature range of 300-500°C and employs a catalyst to facilitate the reaction between ammonia and NOx.

SCR is "proven effective" control technology for cement plants -- CEMEX

2006: American Cement Manufacturer Endorses SCR as "Available NOx control technology" for cement plants

APPLICATION FOR A PSD CONSTRUCTION PERMIT REVIEW CEMEX, INC

.

Kiln 3 Project Brooksville Cement Plant Hernando County, Florida

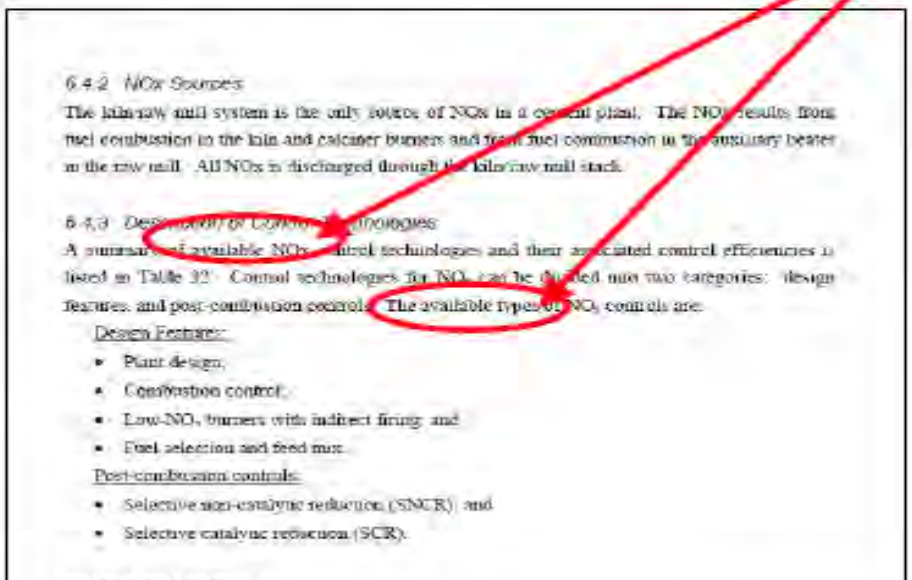
October 12, 2006

"6.4.3 Description of Control Technologies
A summary of **available** NOx control technologies and their associated control efficiencies is listed in Table 32. Control technologies for NOx can be divided into two categories: design features, and post-combustion controls. The **available** types of NOx controls are:

Design Features:
- Plant design;
- Combustion control;
- Low-NOx burners with indirect firing; and
- Fuel selection and feed mix.

Post-combustion controls:
- Selective non-catalytic reduction (SNCR); and
- Selective catalytic reduction (SCR)."

SCR is "available NOx control technology" for cement plants -- CEMEX



6.4.2 *NOx Sources*

The kiln/raw mill system is the only source of NOx in a cement plant. The NOx results from fuel combustion in the kiln and calciner burners and from fuel combustion in the auxiliary heater in the raw mill. All NOx is discharged through the kiln/raw mill stack.

6.4.3 *Description of Control Technologies*

A summary of available NOx control technologies and their associated control efficiencies is listed in Table 32. Control technologies for NO_x can be divided into two categories: design features, and post-combustion controls. The available types of NO_x controls are:

Design Features:
- Plant design;
- Combustion control;
- Low-NO_x burners with indirect firing; and
- Fuel selection and feed mix.

Post-combustion controls:
- Selective non-catalytic reduction (SNCR); and
- Selective catalytic reduction (SCR).

2006: Impact of Kiln Cuts

Star-Telegram FORT WORTH

Thursday, March 16th, 2006

"Using detailed computer models, state regulators have concluded that requiring the three cement plants in Midlothian to add modern pollution controls would apparently lower ozone levels in Fort Worth and Arlington almost enough to meet federal standards by 2009."

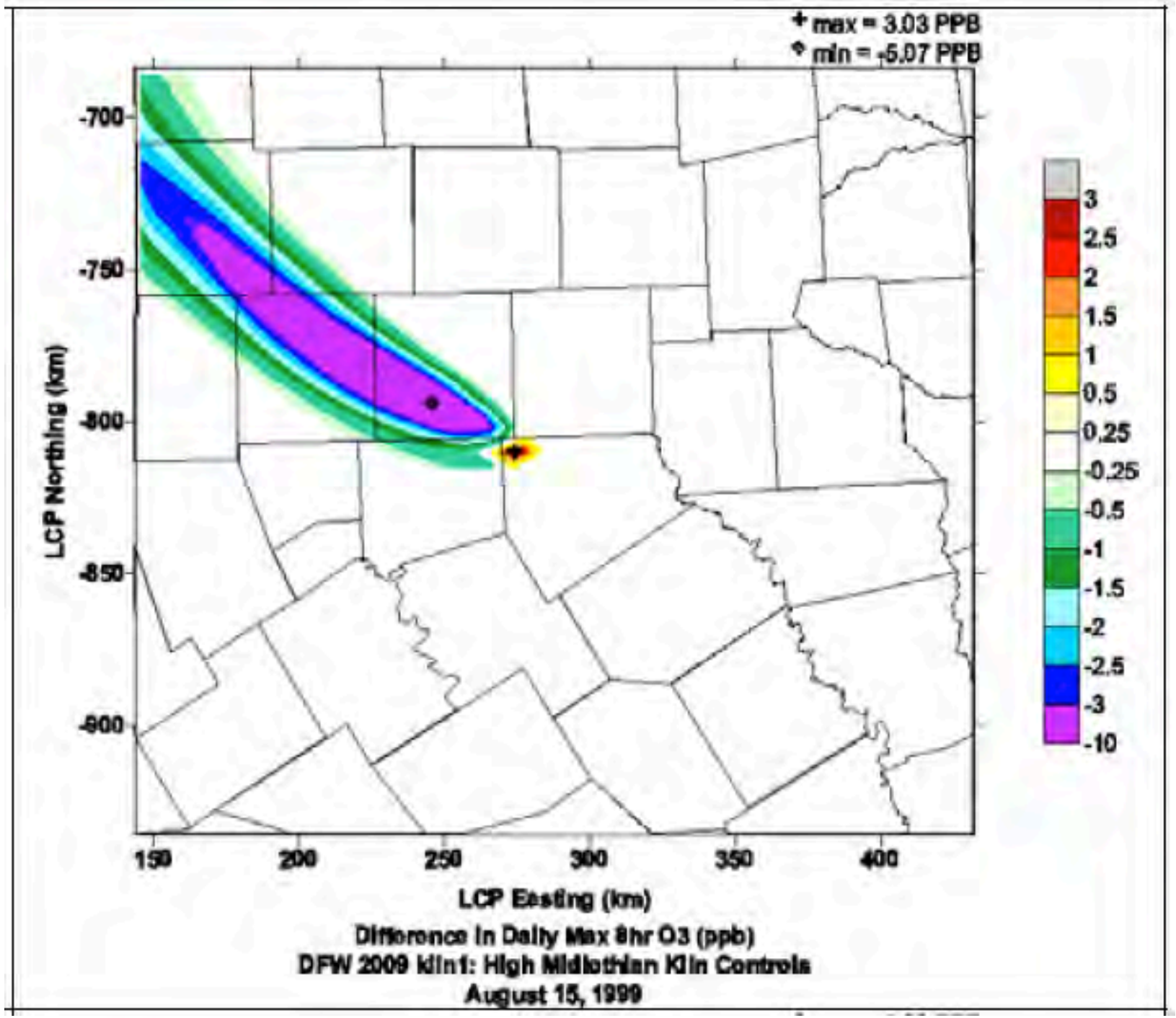
ENVIRON

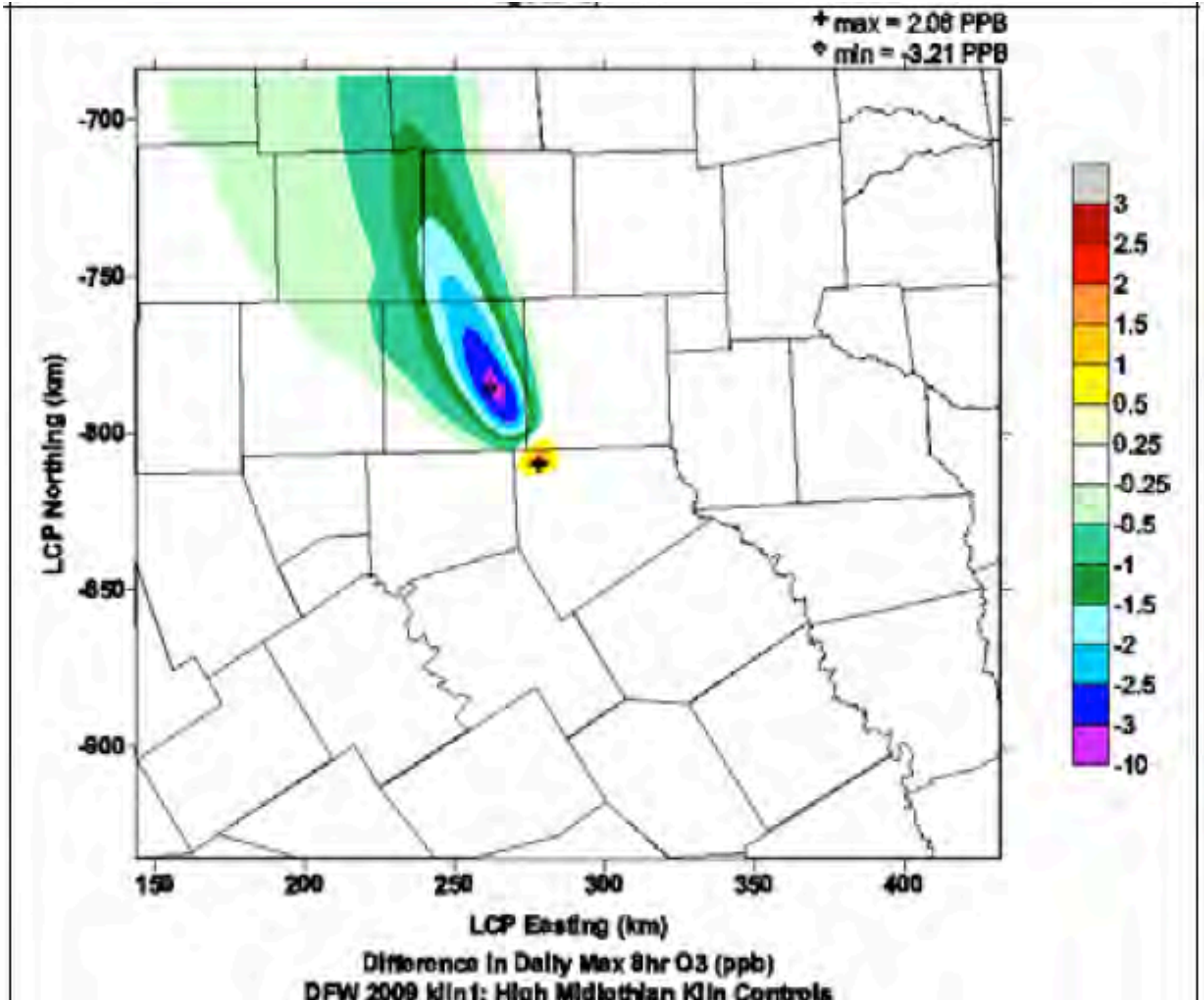
MEMORANDUM

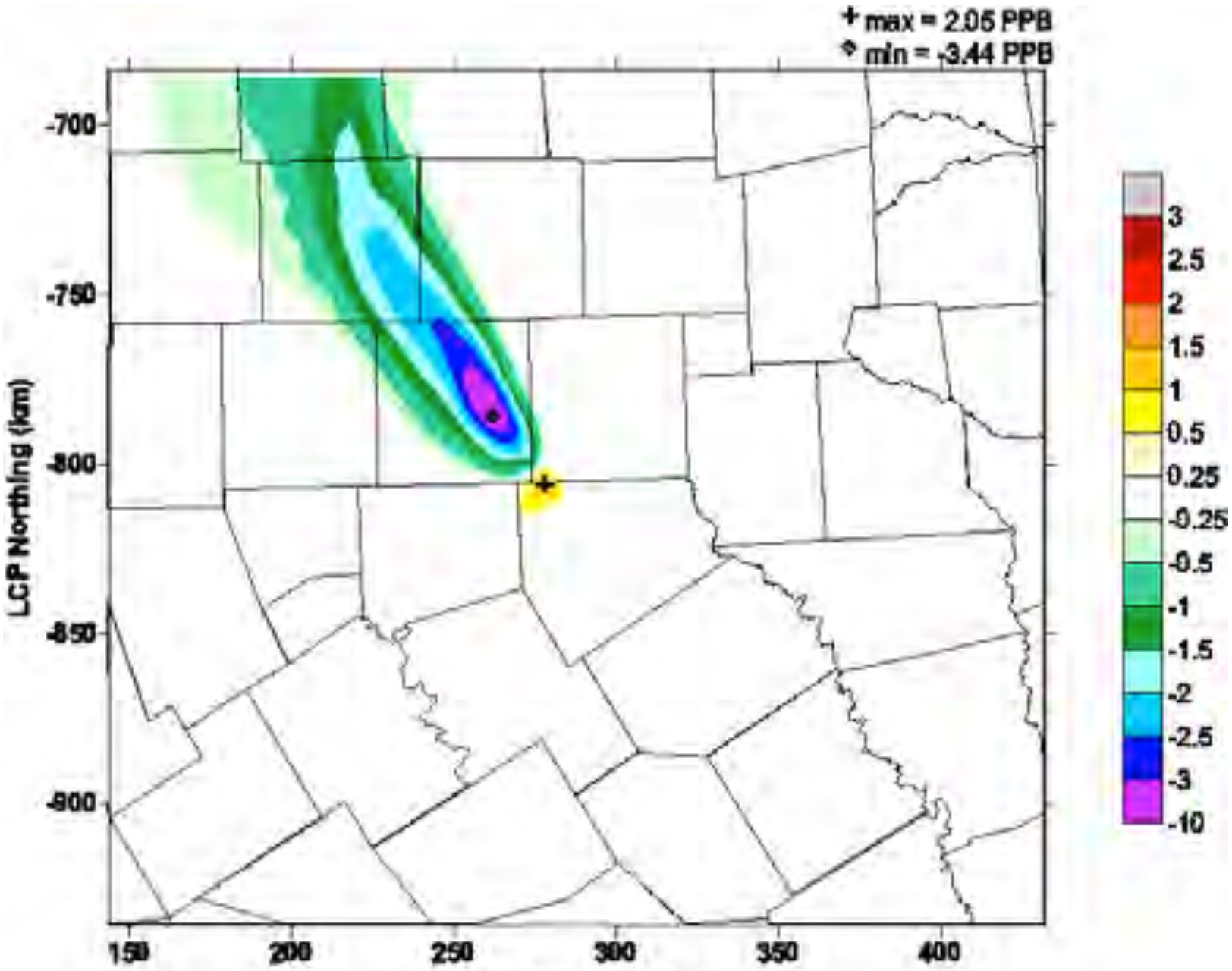
"The high cement kiln control strategy reduced the number of exceedance grid cells in the DFW NAA by 4 % through the episode. Among the 2009 baseline exceedance cells, ***14 % (166 out of 1199) were reduced at least 1 ppb****. The controls appeared most effective on August 16, when 38 % (84 out of 223) exceedance grid cells were reduced at least 1 ppb****, accounting for half the episode total****; the exceedance area was lower by 5 %."*

90% cuts in Kiln Nox =
1 - 3.2 ppb reductions in NW Ft. Worth, Keller and Arlington

Daily Change	High Kiln Control Scenario								
Site	990815	990816	990817	990818	990819	990820	990821	990822	Avg Change
Frisco C31	0.00	0.00	0.20	-0.20	0.00	0.00	0.00	0.00	0.00
Hinton C60	0.00	-0.10	0.20	-0.40	-0.10	0.00	0.00	0.00	-0.05
Dallas N C63	0.00	0.00	0.20	-0.30	-0.10	0.00	0.00	0.00	-0.03
Redbird C402	0.00	-0.30	0.20	-1.10	-0.10	0.10	0.00	0.00	-0.15
Denton C56	0.00	-0.20	-0.20	0.00	-0.10	0.00	0.00	-0.20	-0.09
Midlothian C94	-1.30	-0.30	-0.90	0.20	-1.40	0.60	0.00	0.30	-0.35
Arlington C57	0.00	-3.00	-1.10	-0.60	0.10	0.10	0.00	-3.20	-0.96
FtW NW C13	-1.30	-2.40	-0.90	0.00	0.00	0.00	0.00	-2.30	-0.86
FtW Keller C17	0.00	-1.20	-0.50	0.00	-0.10	0.00	0.00	-0.20	-0.25

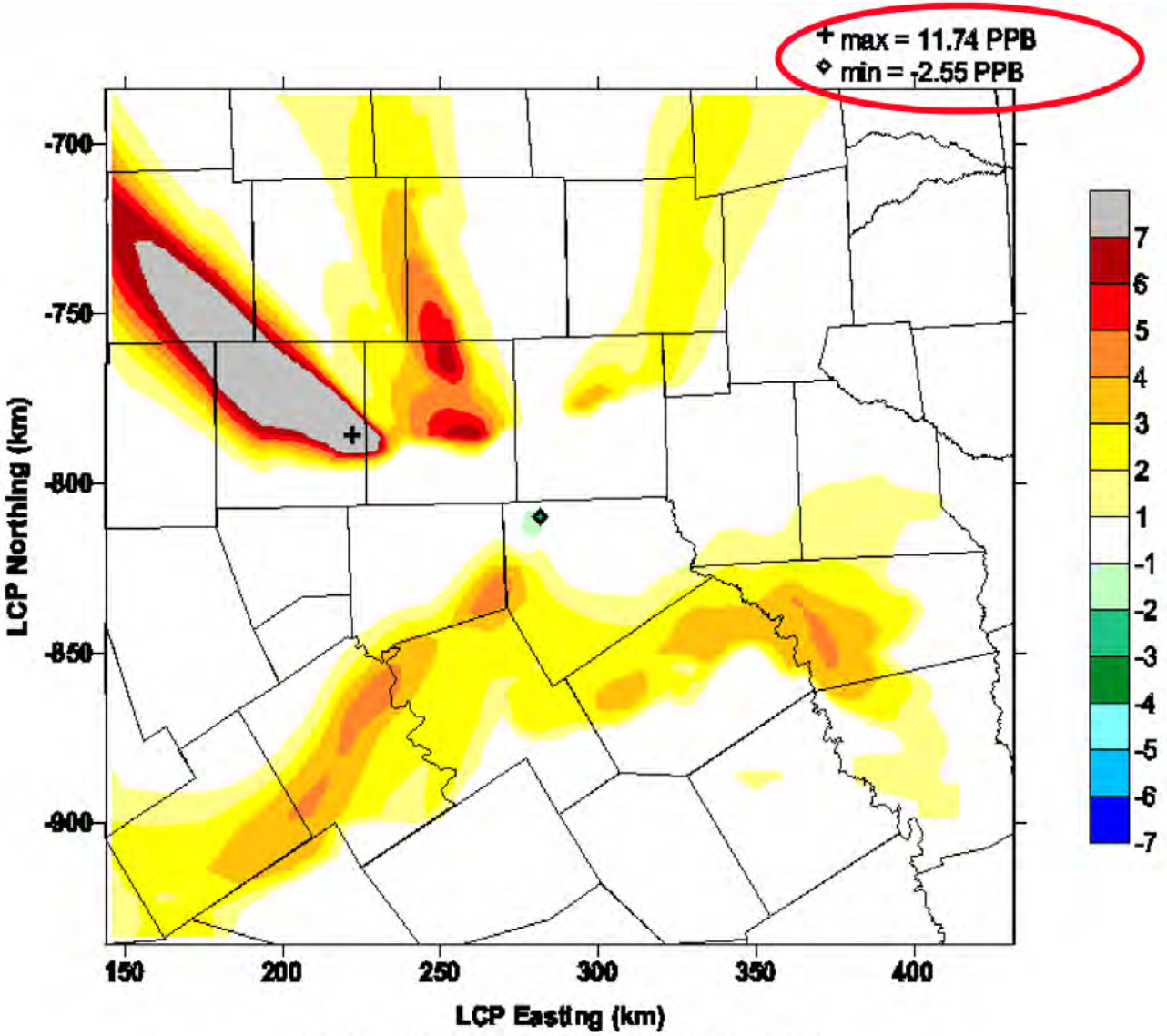

+ max = 3.03 PPB
* min = -5.07 PPB
-700
-750
-800
-850
-900
LCP Northing (km)
150
200
250
300
350
400
LCP Easting (km)
3
2.5
2
1.5
1
0.5
0.25
-0.25
-0.5
-1
-1.5
-2
-2.5
-3
-10
Difference in Daily Max 8hr O3 (ppb)
DFW 2009 klnt: High Midlothian Kiln Controls
August 15, 1999


+ max = 2.08 PPB
* min = -3.21 PPB
-700
-750
-800
-850
-900
LCP Northing (km)
150
200
250
300
350
400
LCP Easting (km)
3
2.5
2
1.5
1
0.5
0.25
-0.25
-0.5
-1
-1.5
-2
-2.5
-3
-10
Difference in Daily Max 8hr O3 (ppb)
DFW 2009 klin1: High Midlothian Kiln Controls



Difference in Daily Max 8hr O3 (ppb)
DFW 2009 kiln1: High Midlothian Kiln Controls
August 22, 1999

Worst Case – All Three @ Max



Contributions to Episode Max 8hr O3 (ppb)
All 3 Cement Kilns at 1.46x Mean Emission Rate
August 13-22, 1999 for FY2010. DFW 04km

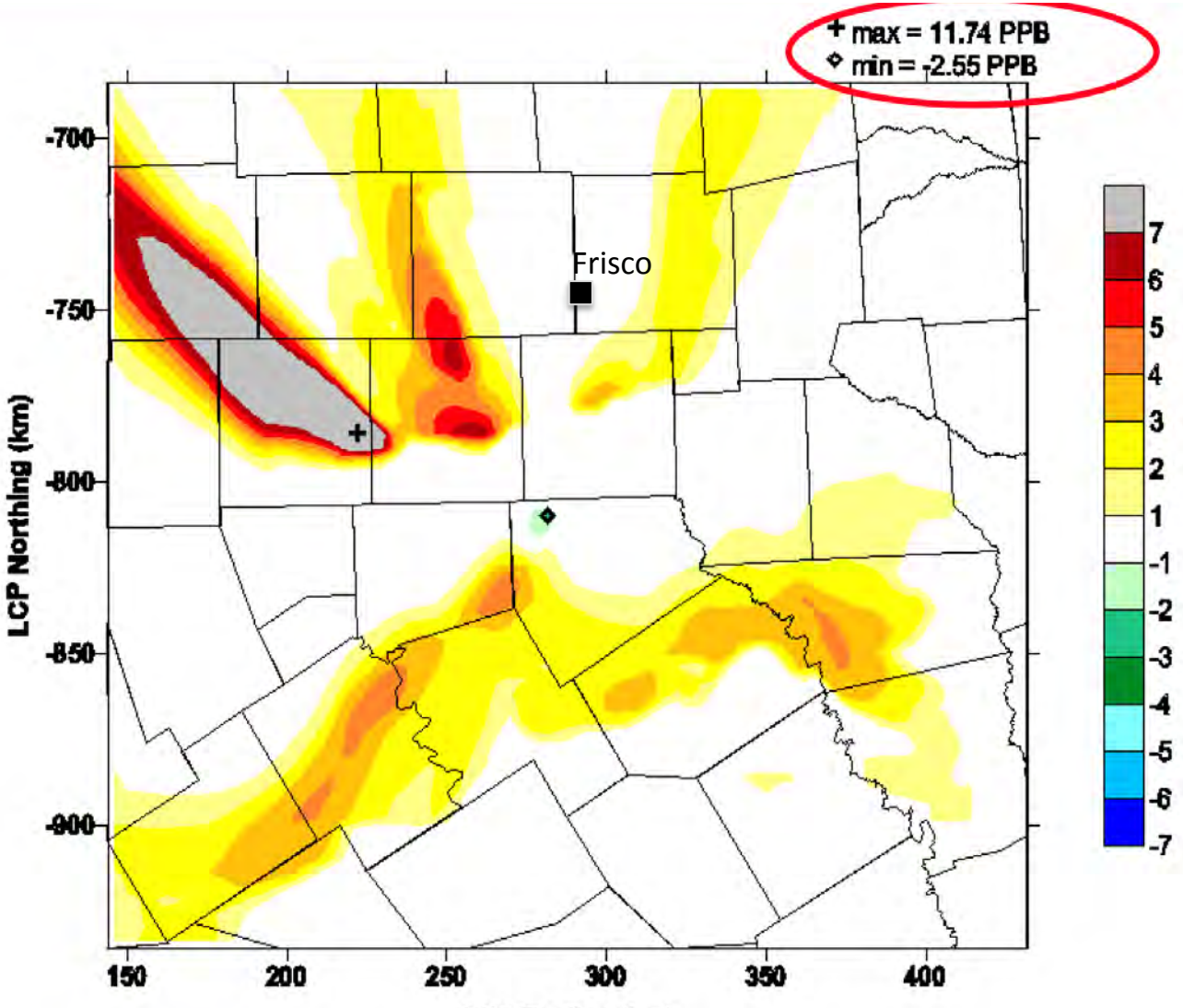
2007 SIP: TCEQ Says Lack of Impact on Frisco Monitor Rules Out SCR…..

"Results:

- *Beneficial impacts primarily on south and west of DFW area*
- ***Emissions plume did not go over Frisco, so no response***
- *This test changed Future DV at Frisco by -0.01/+0.01 ppb"*

Daily Change	High Kiln Control Scenario								
Site	990815	990816	990817	990818	990819	990820	990821	990822	Avg Change
Frisco C31	0.00	0.00	0.20	-0.20	0.00	0.00	0.00	0.00	0.00
Hinton C60	0.00	-0.10	0.20	-0.40	-0.10	0.00	0.00	0.00	-0.05
Dallas N C63	0.00	0.00	0.20	-0.30	-0.10	0.00	0.00	0.00	-0.03
Redbird C402	0.00	-0.30	0.20	-1.10	-0.10	0.10	0.00	0.00	-0.15
Denton C56	0.00	-0.20	-0.20	0.00	-0.10	0.00	0.00	-0.20	-0.09
Midlothian C94	-1.30			0.20	-1.40	0.60	0.00	-1.30	-0.35
Arlington C57	0.00			-0.60	0.10	0.10	0.00		-0.96
FtW NW C13	-1.30	-2	30	0.00	0.00	0.00	0.00	-2	-0.86
FtW Keller C17	0.00			0.00	-0.10	0.00	0.00		-0.25

That's correct. The kilns raised ozone levels in a *ALL TEN Non-Attainment Counties* by 1 to 12 ppb……..But not in Frisco.



2007 SIP: Driven by Frisco Monitor

Year	Monitor with Highest DV	County
1999	Frisco	Collin
2000	Denton	Denton
2001	Denton	Denton
2002	Denton	Denton
2003	Keller	Tarrant
2004	Keller	Tarrant
2005	Ft. Worth NW	Tarrant
2006	Eagle Mt Lake	Tarrant

2007 SIP: North Texas Clean Air Steering Committee Votes for SCR Pilot Testing

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE NORTH TEXAS CLEAN AIR STEERING COMMITTEE:

Section 1: That TCEQ require the kiln owners to have a pilot test(s) conducted for LoTox and/or SCR technologies, conditioned upon an initial demonstration that each technology will be economically, technologically, and environmentally effective and will not adversely affect plant operations and/or facilities.

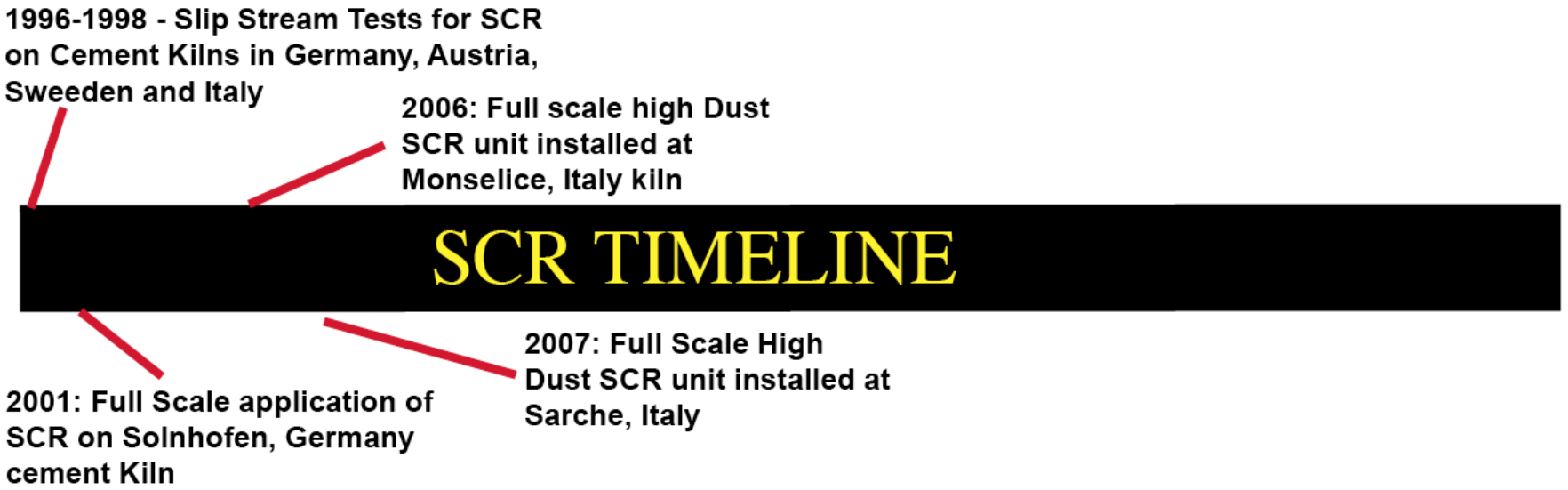
Section 2: That all efforts be made to seek funding assistance from outside sources to offset costs of the cement industry for said pilot test(s).

Section 3: That said pilot test(s) be conducted as quickly as possible and completed no later than September 2007 so that cost effective emission reductions demonstrated from the use of the pilot tested technology can be incorporated into the 2009-2010 State Implementation Plan.

That Request is Rejected by TCEQ.

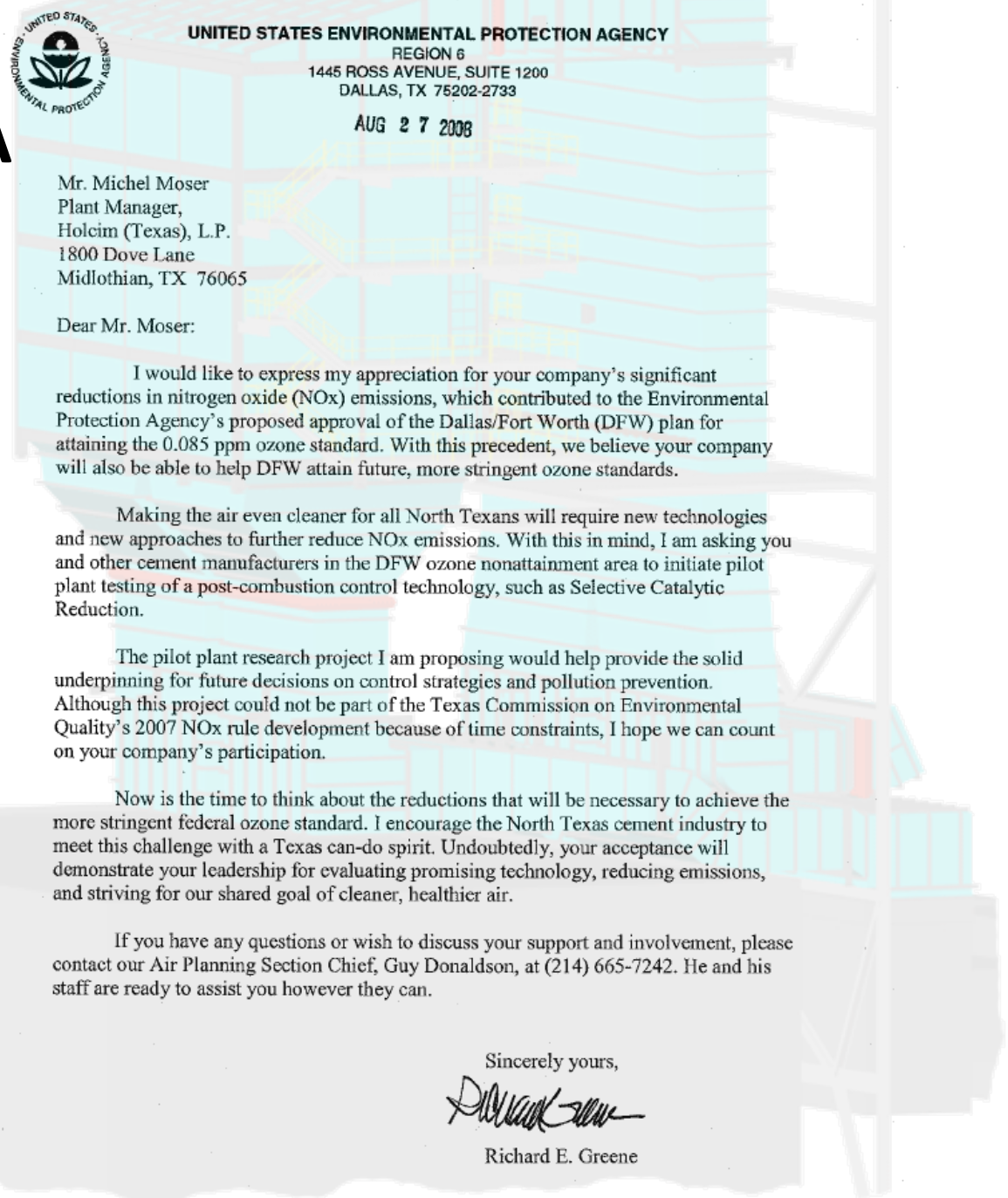
2007 SIP:

TCEQ on SCR: ***"The Cement Kiln Study describes SCR, which can reduce NOx emissions by 80-85%; however it hasn't been applied to wet kilns anywhere in the world. Furthermore, neither has sufficiently tested on cement kilns in design and feed materials to Ellis County kilns to conclude with certainty with certainty that those levels of reductions are achievable"***



2008: (Bush Administration) EPA Regional Administrator Richard Greene Requests Midlothian Kilns to Pilot Test SCR.

That request is also rejected.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

AUG 27 2008

Mr. Michel Moser
Plant Manager,
Holcim (Texas), L.P.
1800 Dove Lane
Midlothian, TX 76065

Dear Mr. Moser:

I would like to express my appreciation for your company's significant reductions in nitrogen oxide (NOx) emissions, which contributed to the Environmental Protection Agency's proposed approval of the Dallas/Fort Worth (DFW) plan for attaining the 0.085 ppm ozone standard. With this precedent, we believe your company will also be able to help DFW attain future, more stringent ozone standards.

Making the air even cleaner for all North Texans will require new technologies and new approaches to further reduce NOx emissions. With this in mind, I am asking you and other cement manufacturers in the DFW ozone nonattainment area to initiate pilot plant testing of a post-combustion control technology, such as Selective Catalytic Reduction.

The pilot plant research project I am proposing would help provide the solid underpinning for future decisions on control strategies and pollution prevention. Although this project could not be part of the Texas Commission on Environmental Quality's 2007 NOx rule development because of time constraints, I hope we can count on your company's participation.

Now is the time to think about the reductions that will be necessary to achieve the more stringent federal ozone standard. I encourage the North Texas cement industry to meet this challenge with a Texas can-do spirit. Undoubtedly, your acceptance will demonstrate your leadership for evaluating promising technology, reducing emissions, and striving for our shared goal of cleaner, healthier air.

If you have any questions or wish to discuss your support and involvement, please contact our Air Planning Section Chief, Guy Donaldson, at (214) 665-7242. He and his staff are ready to assist you however they can.

Sincerely yours,

Richard E. Greene

2010: TXI Decommissions its Wet Kilns

dallasnews

July 7th, 2010

"TXI will permanently shut down its four oldest, highest-polluting cement kilns in Midlothian and will stop burning hazardous waste as fuel, the Dallas-based company said Tuesday."

2011 SIP: "New Cars" Means No Need for Controls

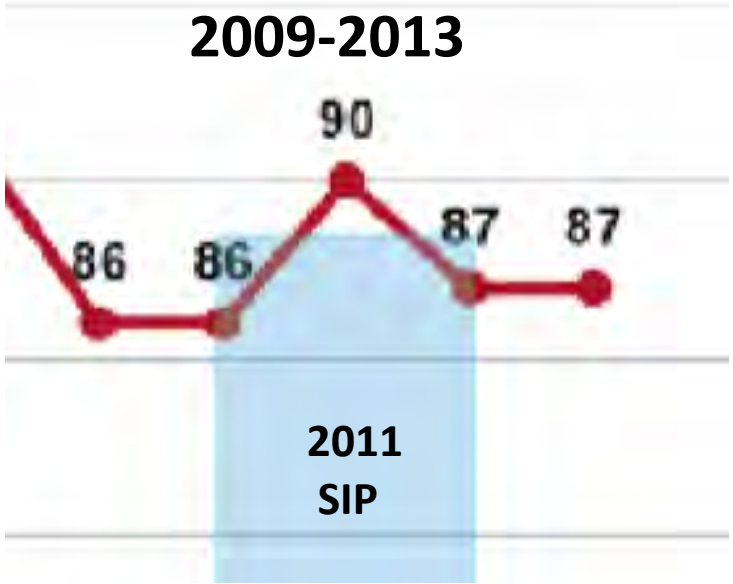
"Photochemical grid modeling performance has been rigorously evaluated."

"The photochemical modeling indicates the DFW area will attain the 1997 eight-hour ozone standard and additional control measures are not necessary for the area to demonstrate attainment by the attainment date."

"Based on the photochemical grid modeling results and these corroborative analyses, the weight of evidence indicates that the DFW area will attain the 1997 eight-hour ozone standard by June 15, 2013."

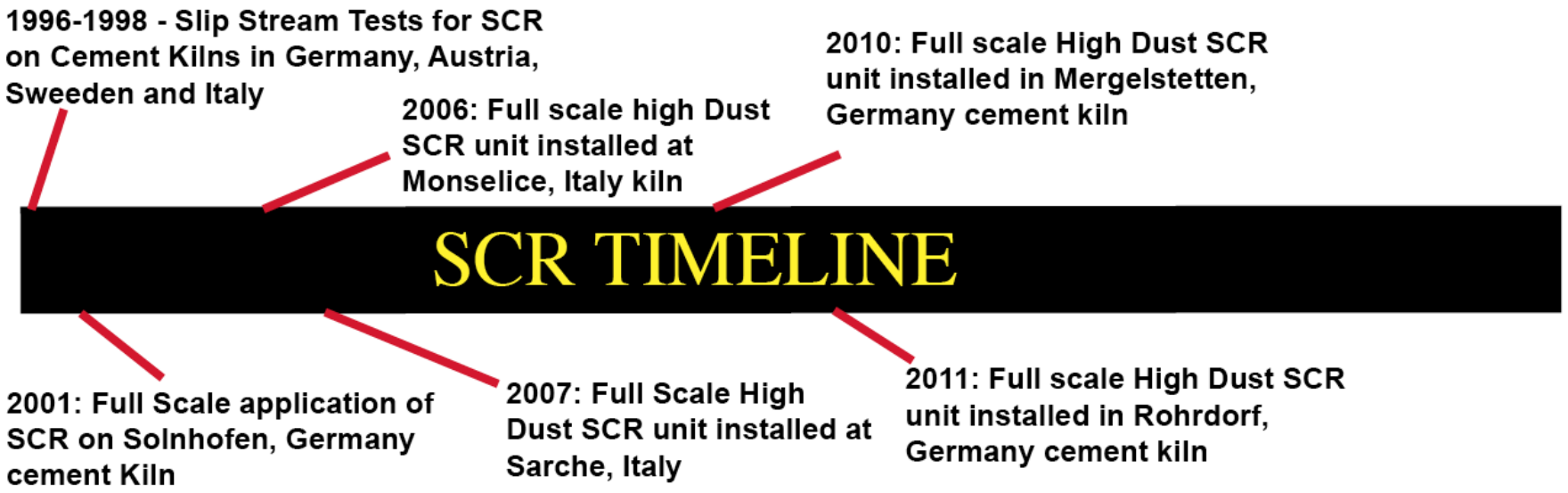
2011 SIP: Massive Fail

Instead, the 2011 SIP has the distinction of being the *only DFW SIP (so far) to leave the ozone Design Value HIGHER after its completion.*



2011 SIP: Still No SCR

"SCR has not yet been demonstrated on the types of cements kilns in Ellis County. The commission is not aware of any new available information that would change its determination regarding the applicability of SCR technology on cement kilns."



2012: "Ash Grove Settlement with Justice Department Requires Midlothian Kilns to Be Converted to Dry Technology"

As of 2015, *only dry kilns with SNCR* will be operating in North Texas…

2005 TCEQ Report : "SCR is an available technology for dry kilns"

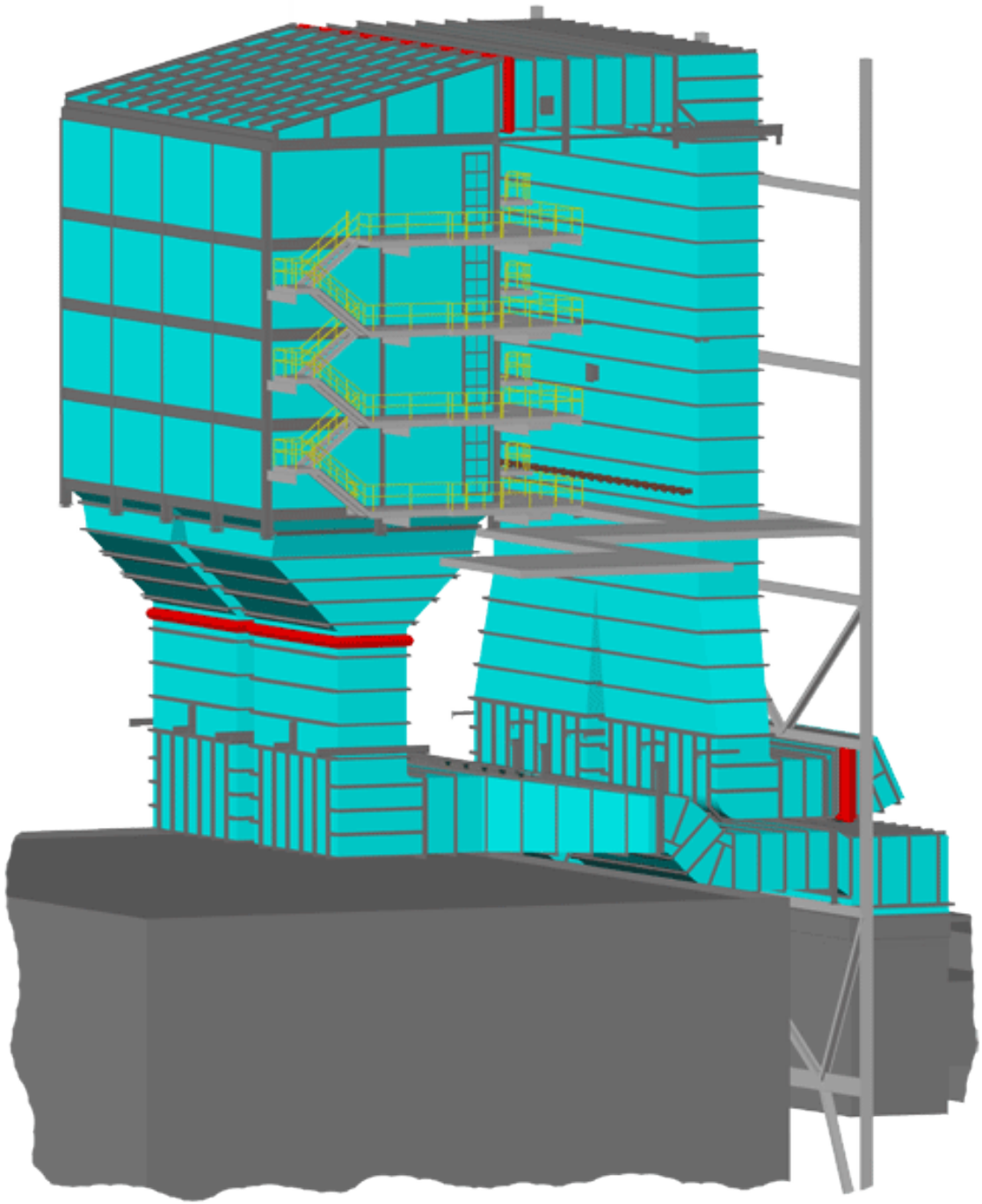
SCR-SNCR Hybrids = Lower Costs of SCR

- Higher NOx removal rates compared to SNCR alone, and often SCR alone

- Improved efficiency

- Smaller SCR catalyst bed, which means lower operation and maintenance costs compared to SCR alone

- Easier retrofit

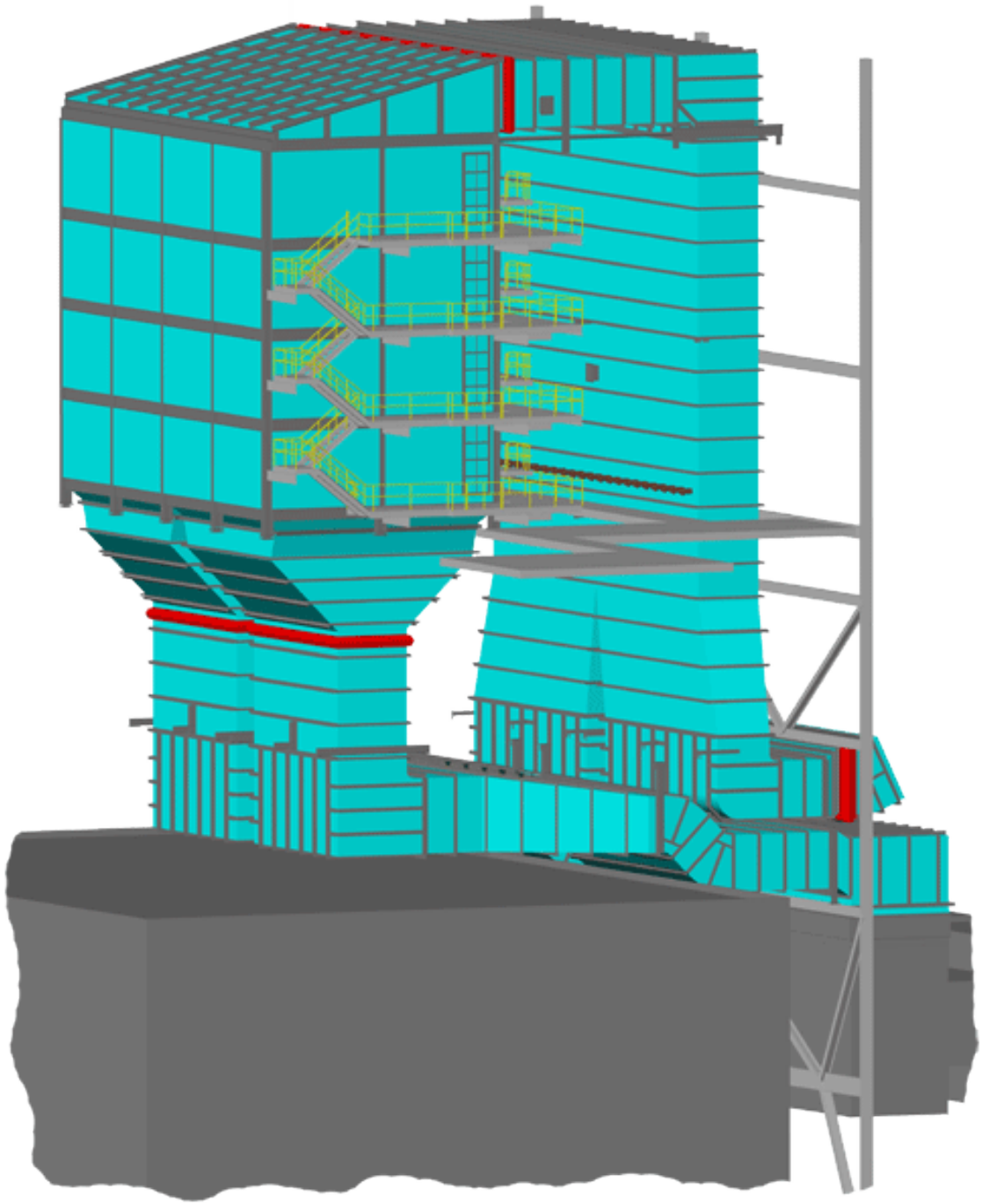


Co-Benefits of SCR on Midlothian Cement Kilns

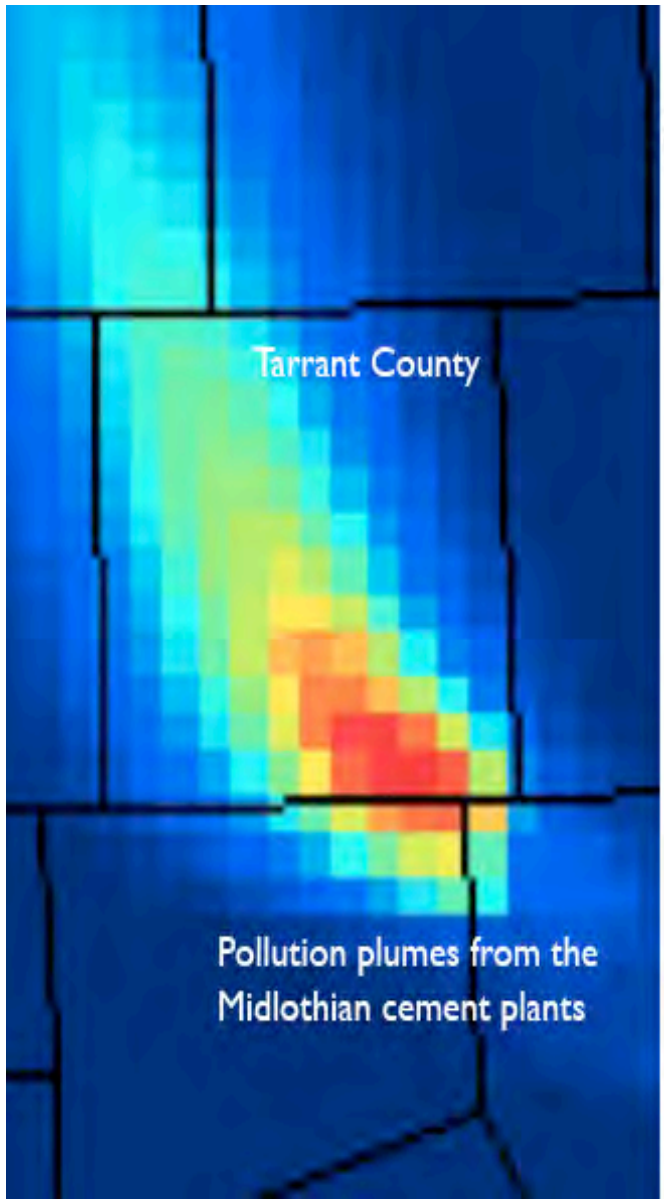
-Significant Reduction in Particulate Matter Pollution

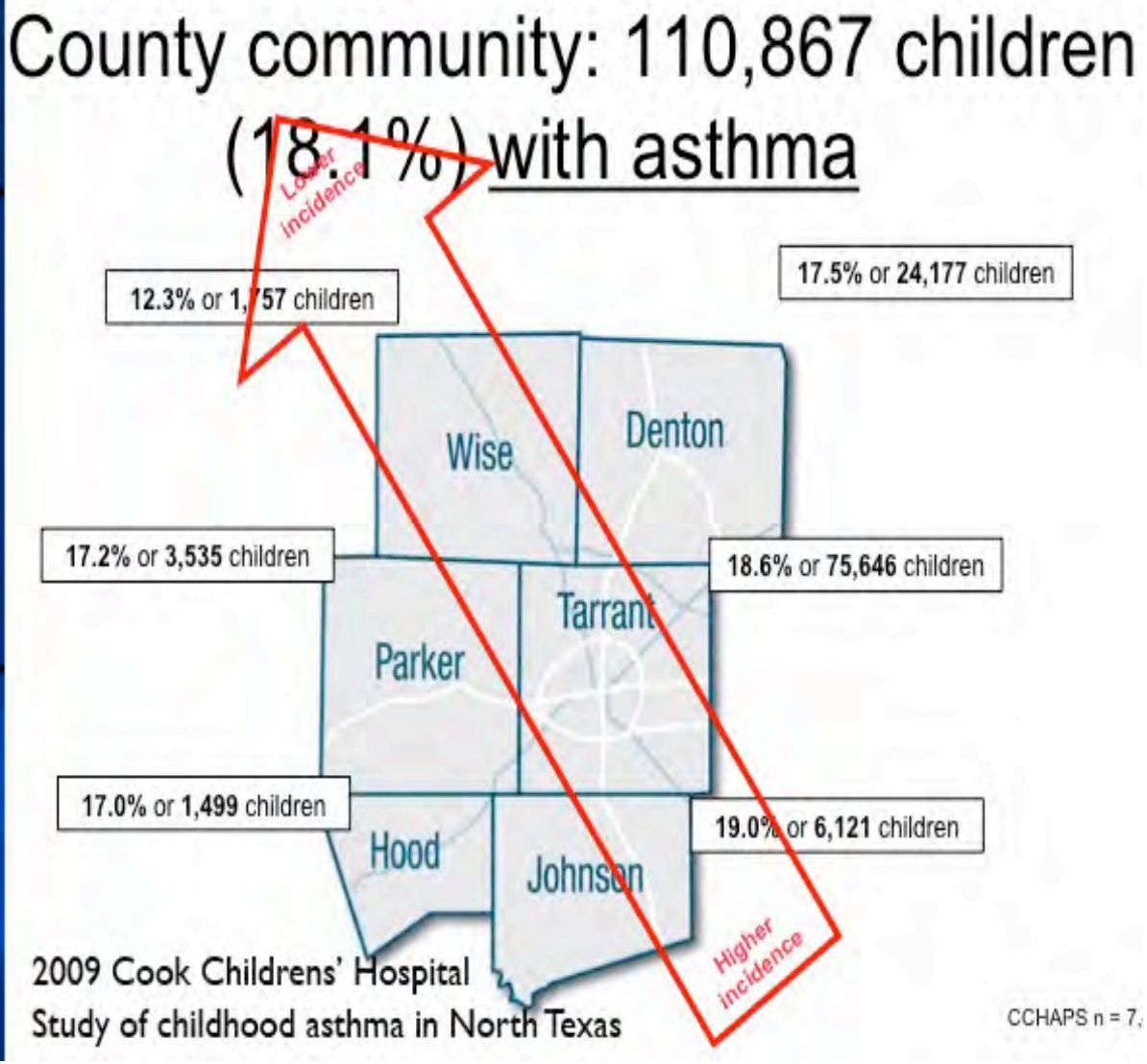
-Significant Reduction in Dioxin Pollution

-Significant Reduction in VOCs

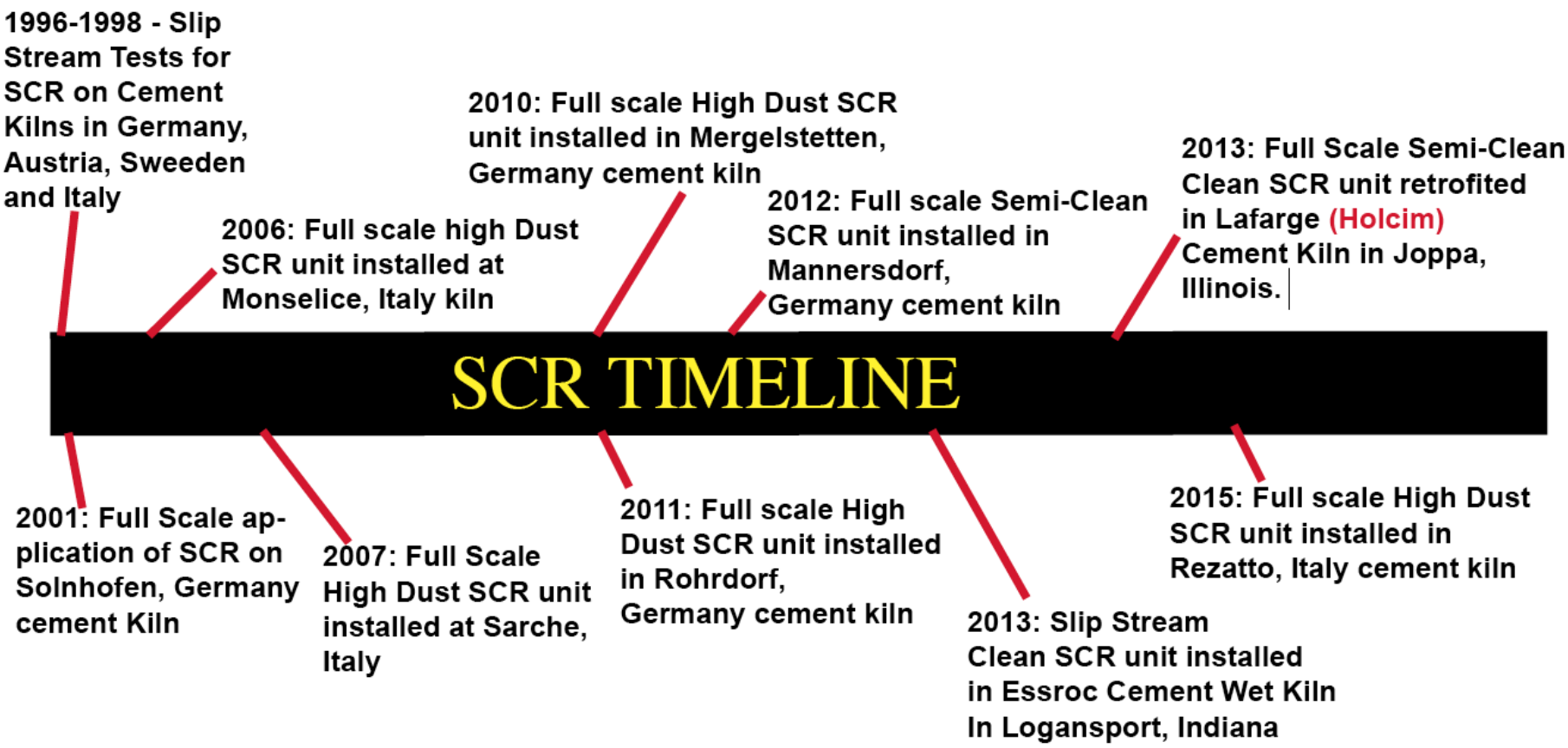


Co-Benefits of SCR on Midlothian Cement Kilns

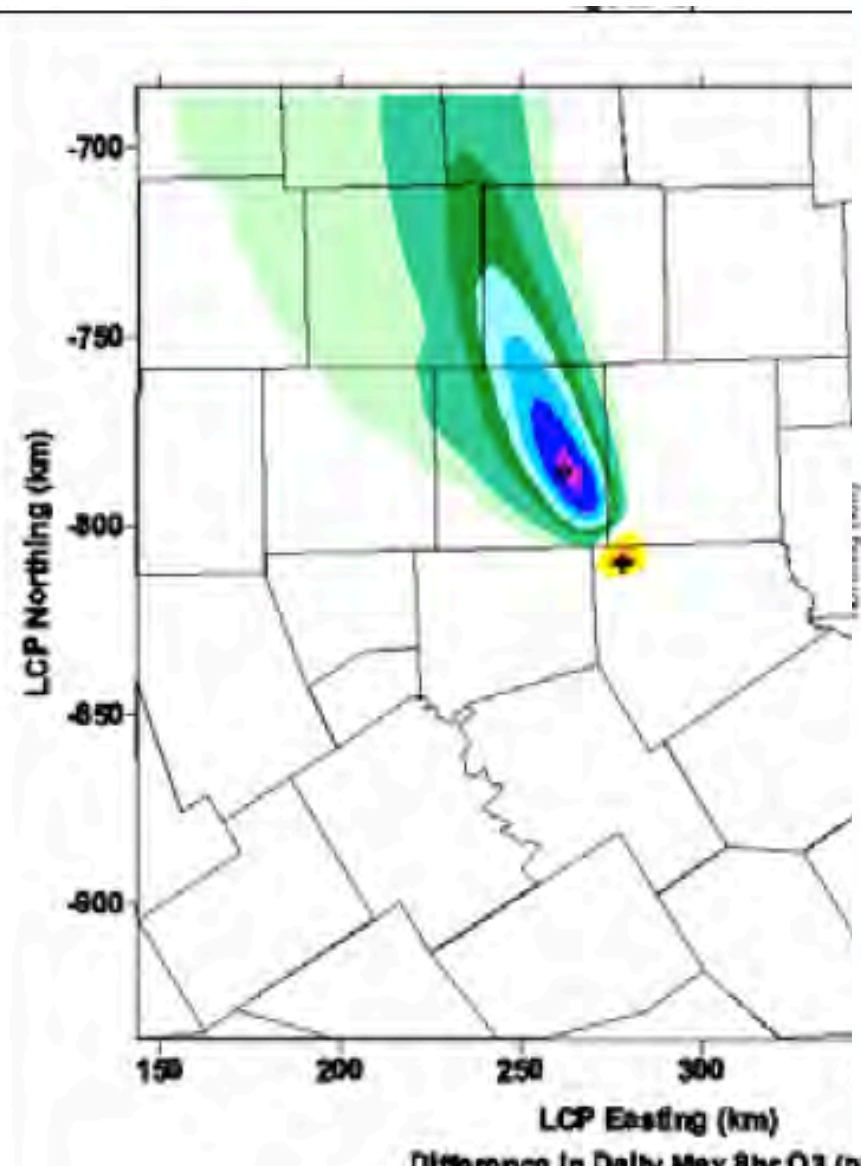


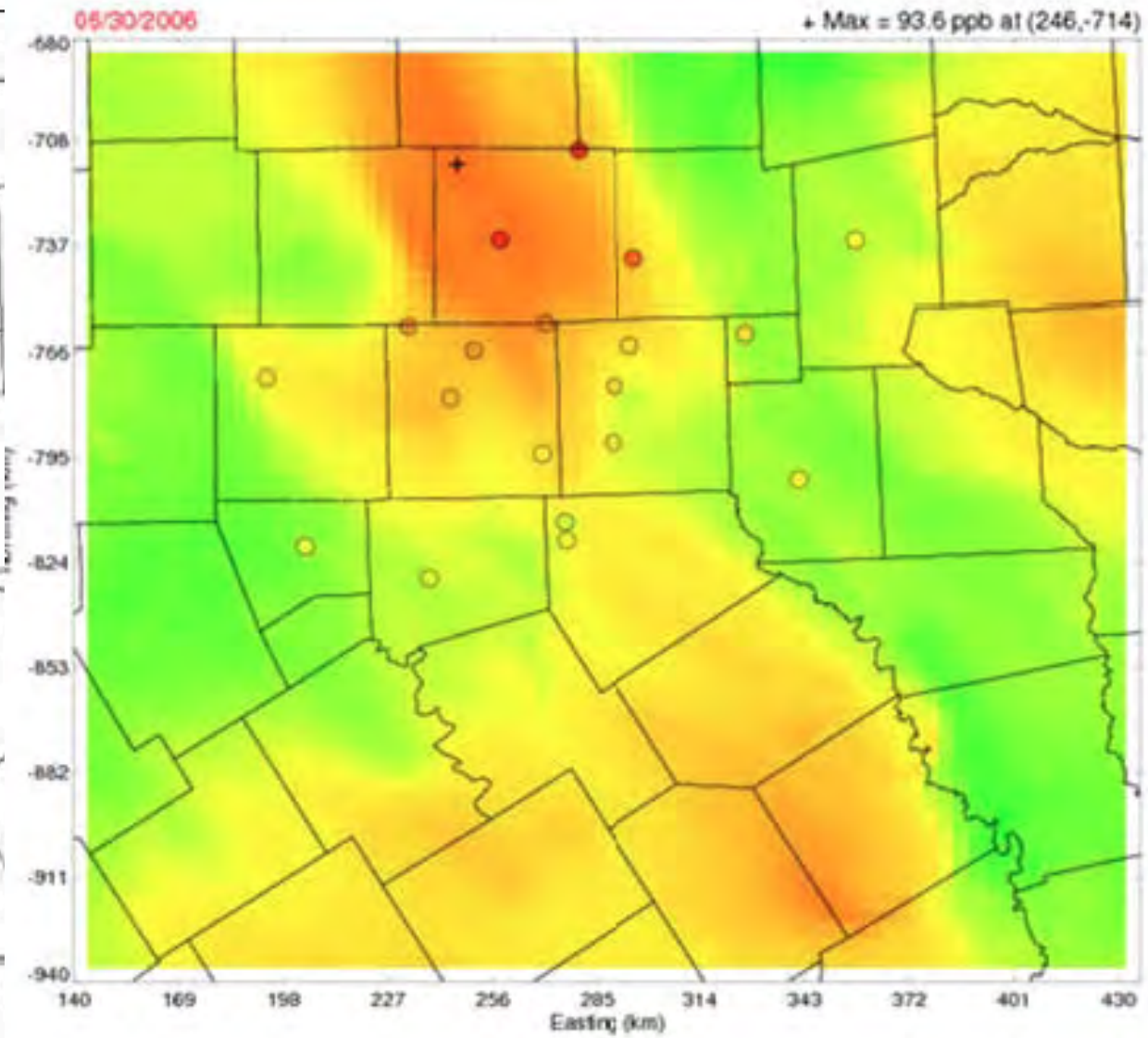


2018 SIP?

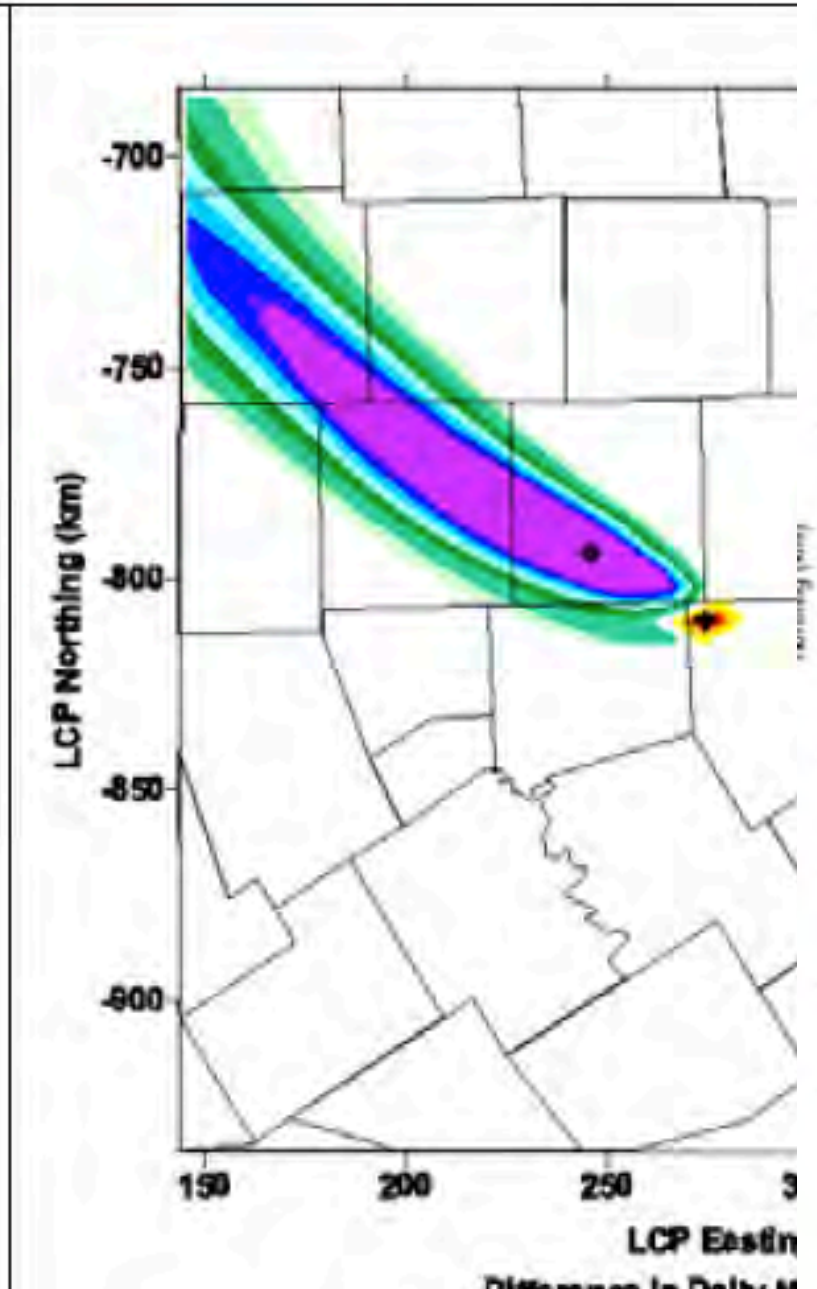

1996-1998 - Slip Stream Tests for SCR on Cement Kilns in Germany, Austria, Sweeden and Italy
2006: Full scale high Dust SCR unit installed at Monselice, Italy kiln
2010: Full scale High Dust SCR unit installed in Mergelstetten, Germany cement kiln
2012: Full scale Semi-Clean SCR unit installed in Mannersdorf, Germany cement kiln
2013: Full Scale Semi-Clean Clean SCR unit retrofited in Lafarge (Holcim) Cement Kiln in Joppa, Illinois.
SCR TIMELINE
2001: Full Scale application of SCR on Solnhofen, Germany cement Kiln
2007: Full Scale High Dust SCR unit installed at Sarche, Italy
2011: Full scale High Dust SCR unit installed in Rohrdorf, Germany cement kiln
2013: Slip Stream Clean SCR unit installed in Essroc Cement Wet Kiln In Logansport, Indiana
2015: Full scale High Dust SCR unit installed in Rezatto, Italy cement kiln

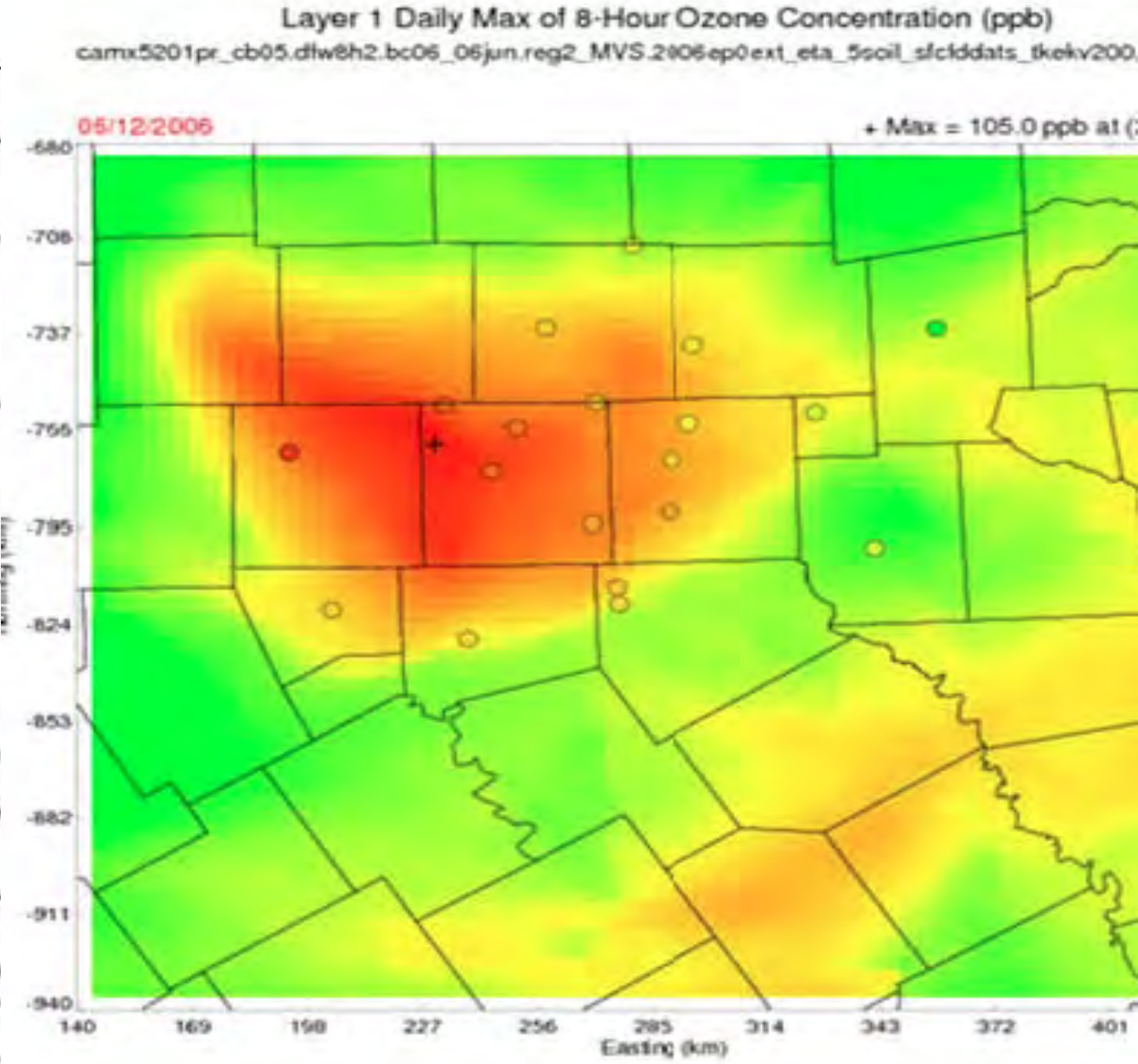
Kiln Impacts vs 2018 Plan Modeling Episode

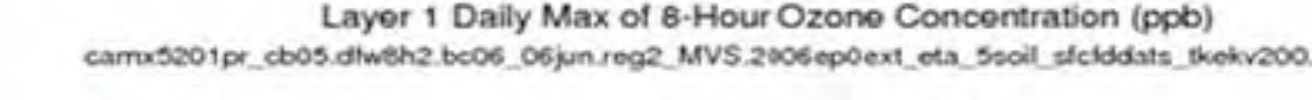




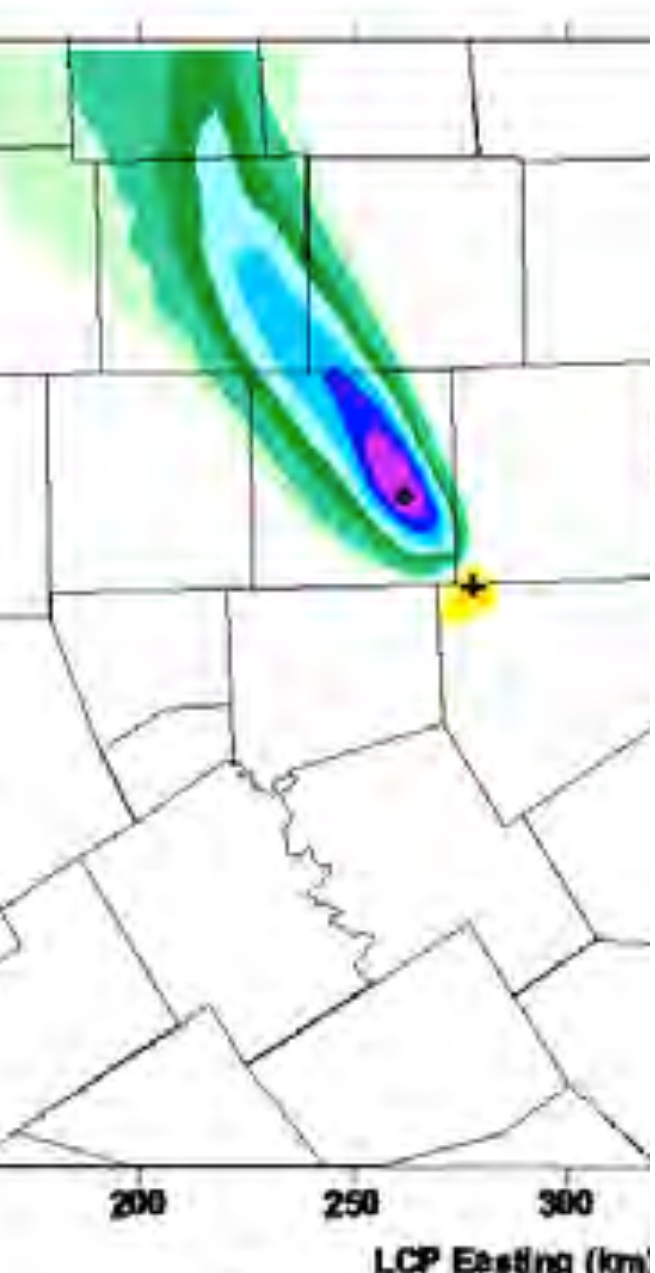
Kiln Impacts vs 2018 Plan Modeling Episode

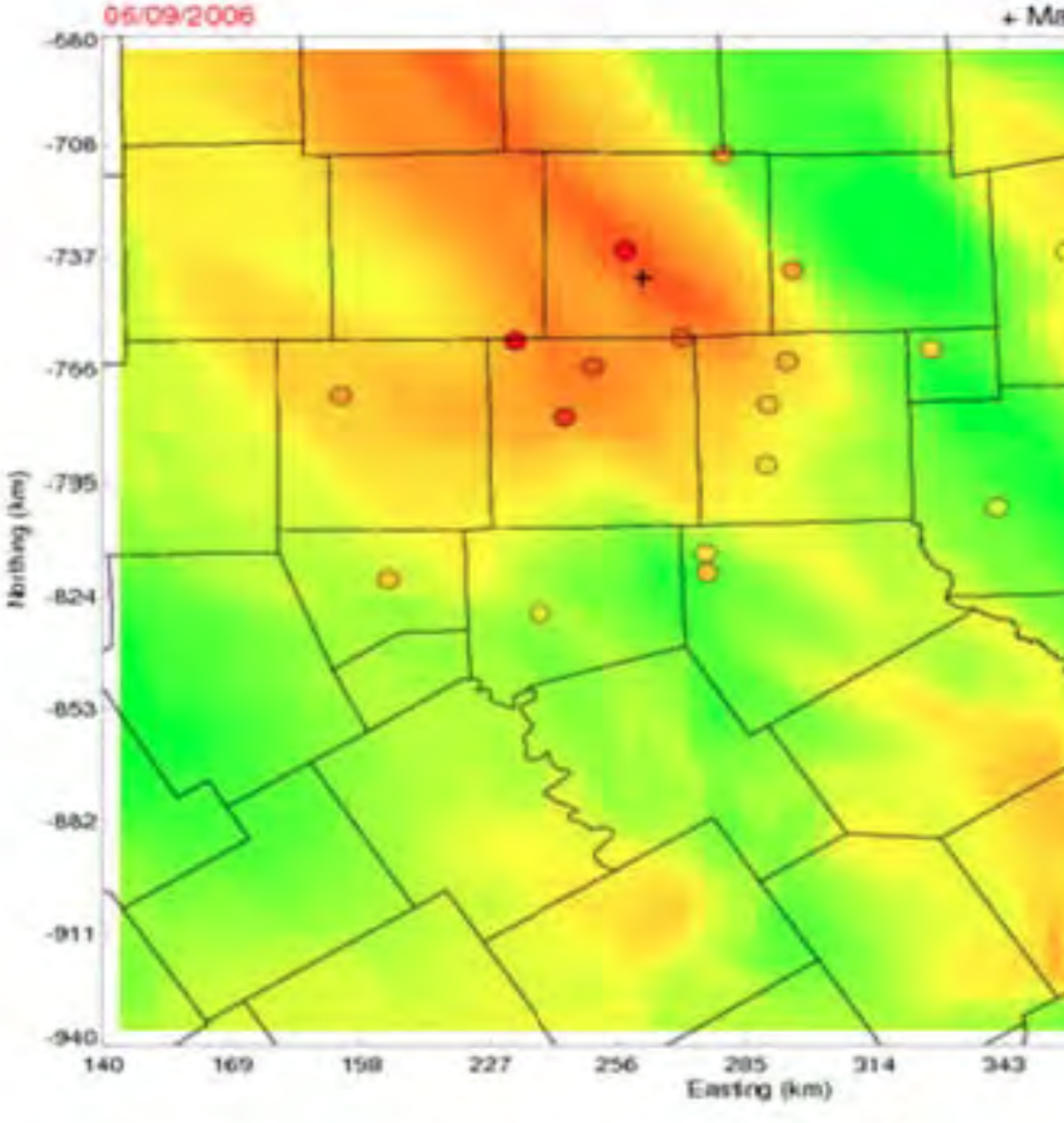




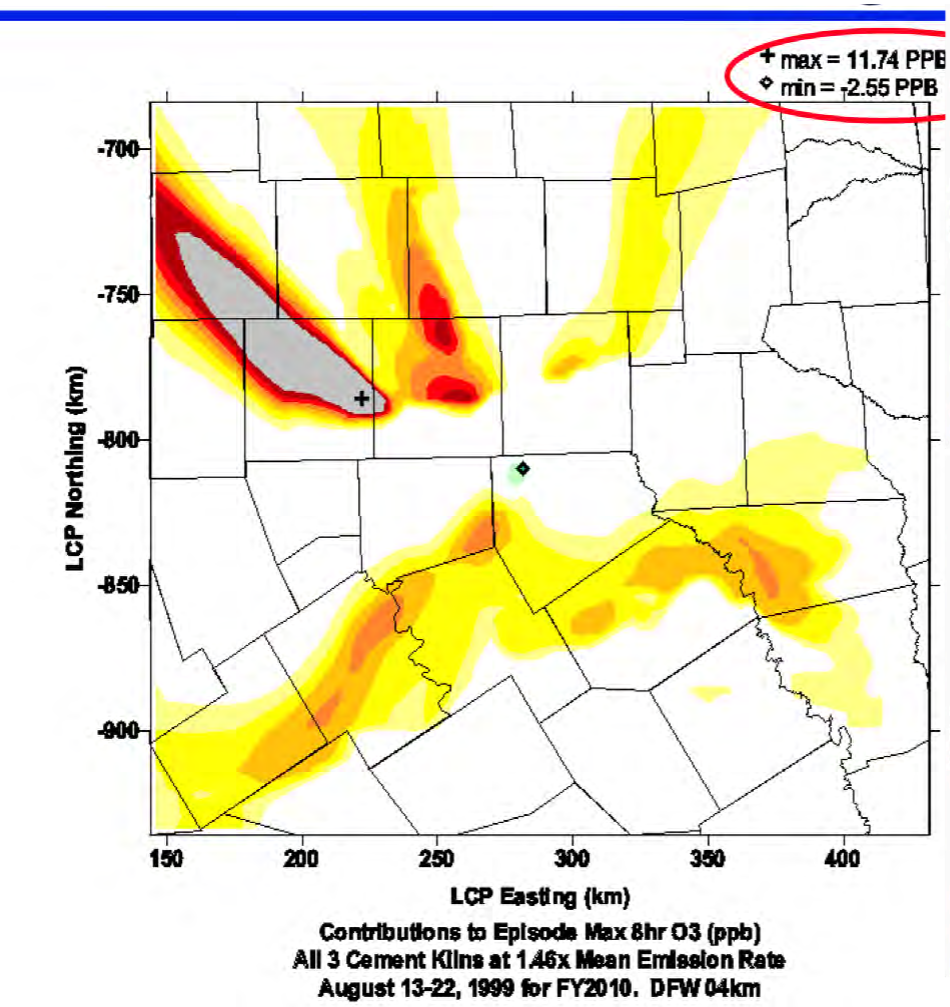


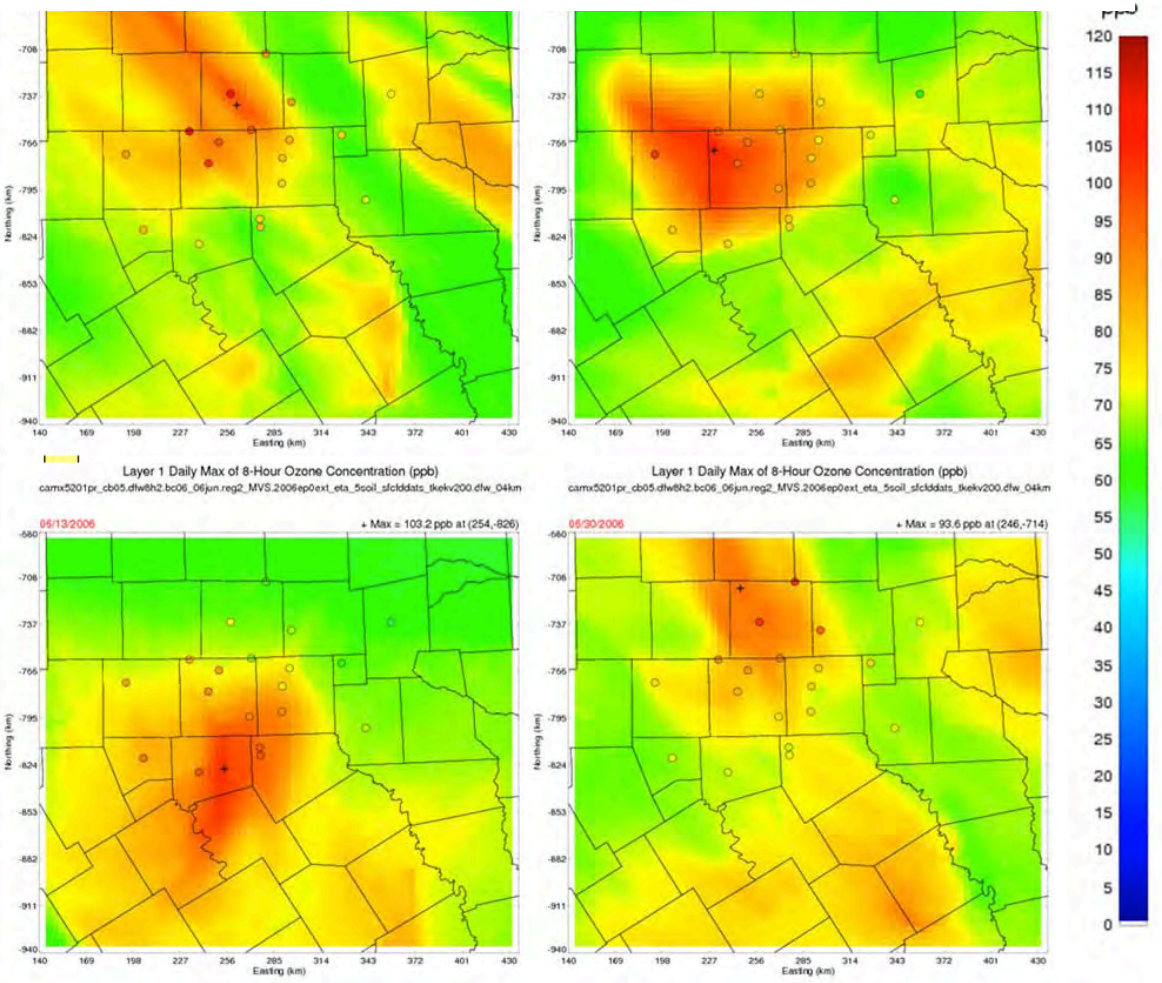
Kiln Impacts vs 2018 Plan Modeling Episode





Kiln Impacts vs 2018 Plan Modeling Episode





2013 UTA STUDY

ASSESSING CONTROL STRATEGIES FOR GROUND-LEVEL OZONE

NEELESH V. SULE, Ph.D., P.E.
North Central Texas Council of Governments
November 5, 2013

90% reduction in cement plant NOx pollution between 6 am and 12 Noon =

2.04 ppb decrease of ozone in the Denton monitor

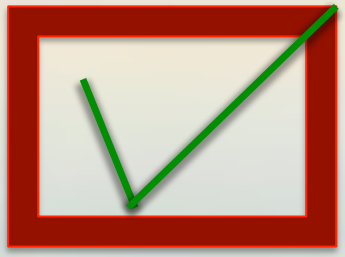
Monitoring Region	Time period	Controls Selected	Emission variables	Emission Reduction by Selected Control, tons	Total Emission Reduction, tons	Percent Reduction by Selected Control measure	Percent of Supplemental Emission Reduction	Total Percent Reduction	Reduction of Previous Day Ozone in 7PM – Midnight
Collin	6 am – 12 noon	EGU	P5Ka 6-12nN	0.187	1.009	16.68	73.32	90	Dallas: 3.33 ppb. (50.94 ppb to 47.61 ppb)
Collin	12noon – 3 pm	EGU	P5Ka 6-12nN	0.187	1.009	16.68	73.32	90	Dallas: 3.33ppb. (50.94 ppb to 47.61 ppb)
		Clean Fleet Program	LEI 9-3pm N	0.139	0.139	5.2	0	5.2	
Tarrant	6 am – 12 noon	Cement Kilns	P7EI 6-12n N	4.35	6.024	65.00	25.00	90	Denton: 2.04 ppb (42.21 ppb to 40.17 ppb)

Documented Ozone Reductions from 90% Cuts *(6500 tpd to 650)* in NOx from Kilns

Denton	**77.6 › 75.6**
Eagle Mt Lake	**76.4**
Grapevine	**76.3**
Keller	**75.3 › 74.1**
Wise Co	**?**

SCR in Kilns *IS* RACM:

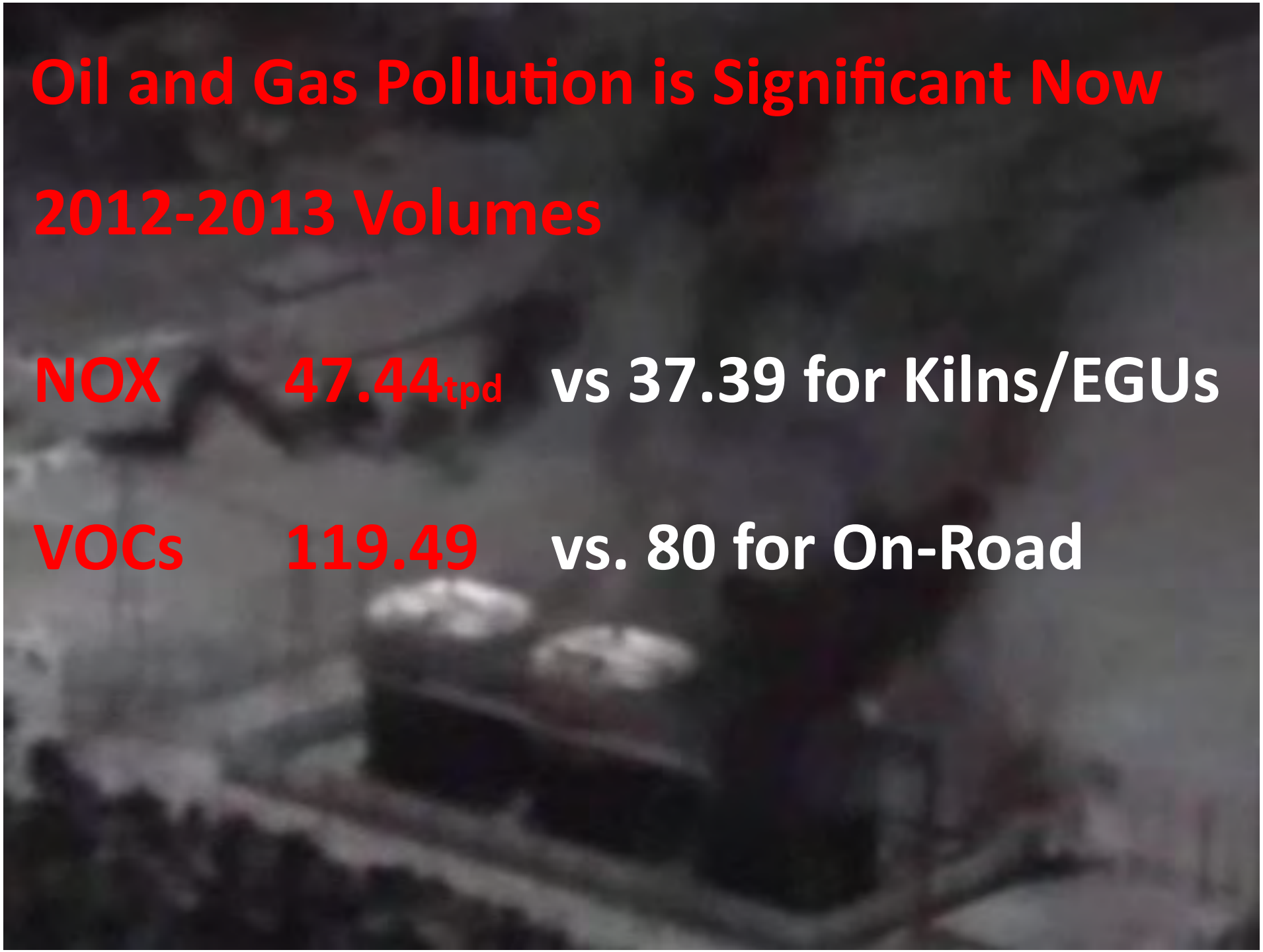
Technologically Feasible?

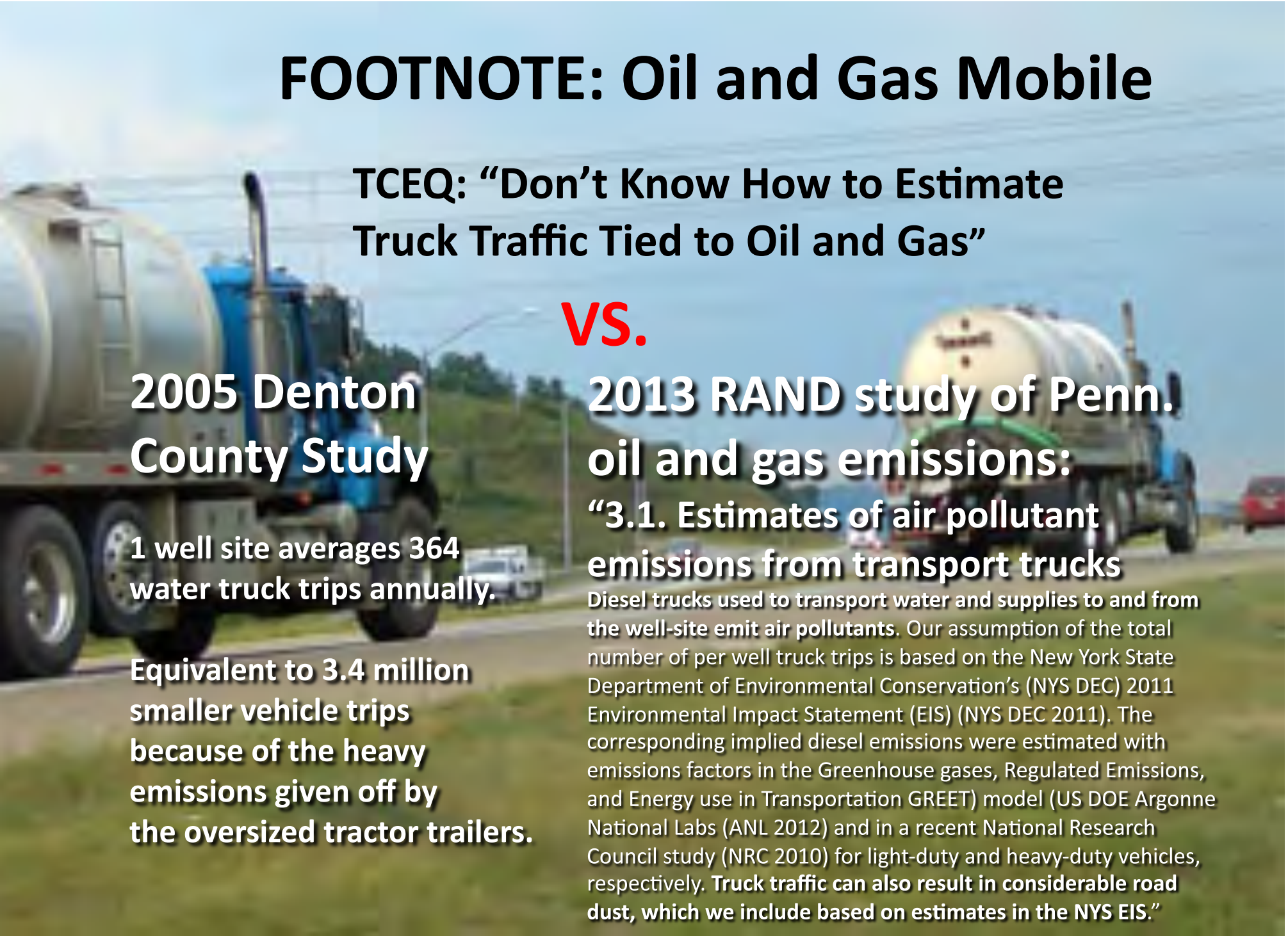


Economically Feasible?

EPA must make TCEQ explain why SCR is not being required in the 2018 SIP as "as expeditiously as practicable."

RACM Strategy #2: ELECTRIC COMPRESSORS


Oil and Gas Pollution is Significant Now
2012-2013 Volumes
NOX 47.44tpd vs 37.39 for Kilns/EGUs
VOCs 119.49 vs. 80 for On-Road



FOOTNOTE: Oil and Gas Mobile

TCEQ: "Don't Know How to Estimate Truck Traffic Tied to Oil and Gas"

VS.

2005 Denton County Study

1 well site averages 364 water truck trips annually.

Equivalent to 3.4 million smaller vehicle trips because of the heavy emissions given off by the oversized tractor trailers.

2013 RAND study of Penn. oil and gas emissions:

"3.1. Estimates of air pollutant emissions from transport trucks

Diesel trucks used to transport water and supplies to and from the well-site emit air pollutants. Our assumption of the total number of per well truck trips is based on the New York State Department of Environmental Conservation's (NYS DEC) 2011 Environmental Impact Statement (EIS) (NYS DEC 2011). The corresponding implied diesel emissions were estimated with emissions factors in the Greenhouse gases, Regulated Emissions, and Energy use in Transportation GREET) model (US DOE Argonne National Labs (ANL 2012) and in a recent National Research Council study (NRC 2010) for light-duty and heavy-duty vehicles, respectively. **Truck traffic can also result in considerable road dust, which we include based on estimates in the NYS EIS.**"

January TCEQ Presentation to Technical Committee

2018 Ten-County DFW Area Anthropogenic Emissions Summary by Source Category

Source Category Description	2018 Summer Weekday Emissions (tons per day)		2018 Summer Weekday Emissions Distribution	
	NO_x	VOC	NO_x	VOC
On-Road	113.21	55.61	39.0%	11.9%
Non-Road	39.87	32.77	13.7%	7.0%
Area	30.76	284.94	10.6%	60.8%
Off-Road – Locomotives	18.90	0.93	6.5%	0.2%
Off-Road – Airports	11.77	3.53	4.1%	0.8%
Oil and Gas - Production	12.21	43.68	4.2%	9.3%
Oil and Gas - Drill Rigs	5.83	0.01	2.0%	0.002%
Point - Electric Utilities	15.02	2.05	5.2%	0.4%
Point - Cement Kilns	17.60	0.80	6.1%	0.2%
Point - Other	24.95	44.24	8.6%	9.4%
Total	290.12	468.56	100.0%	100.0%

? 6.35 .55 + + 14.3 13.88 =

OIL AND GAS TOTAL 38.69 58.12

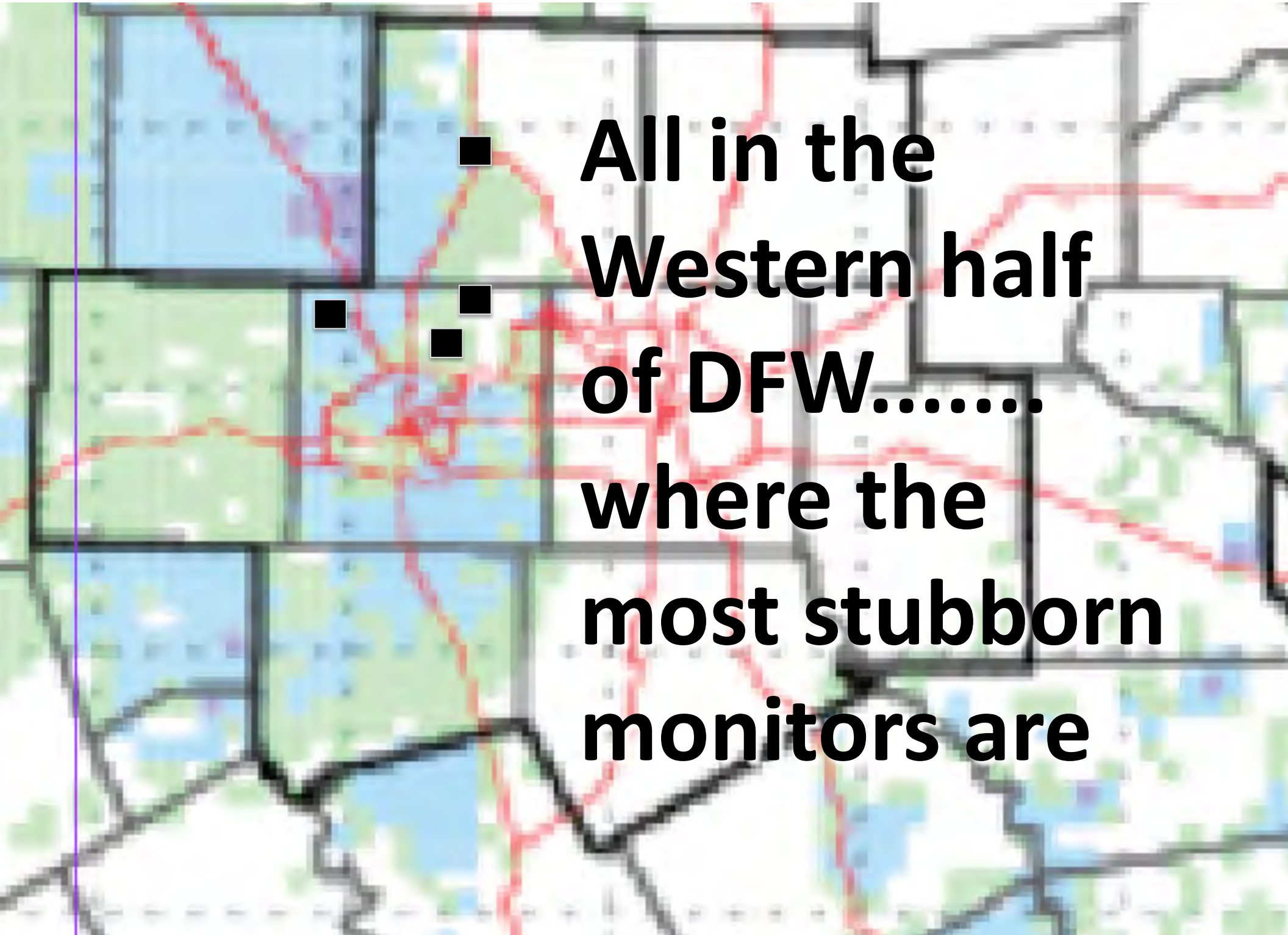
2018 Ten County DFW Area Anthropogenic Emissions Summary by Source Category

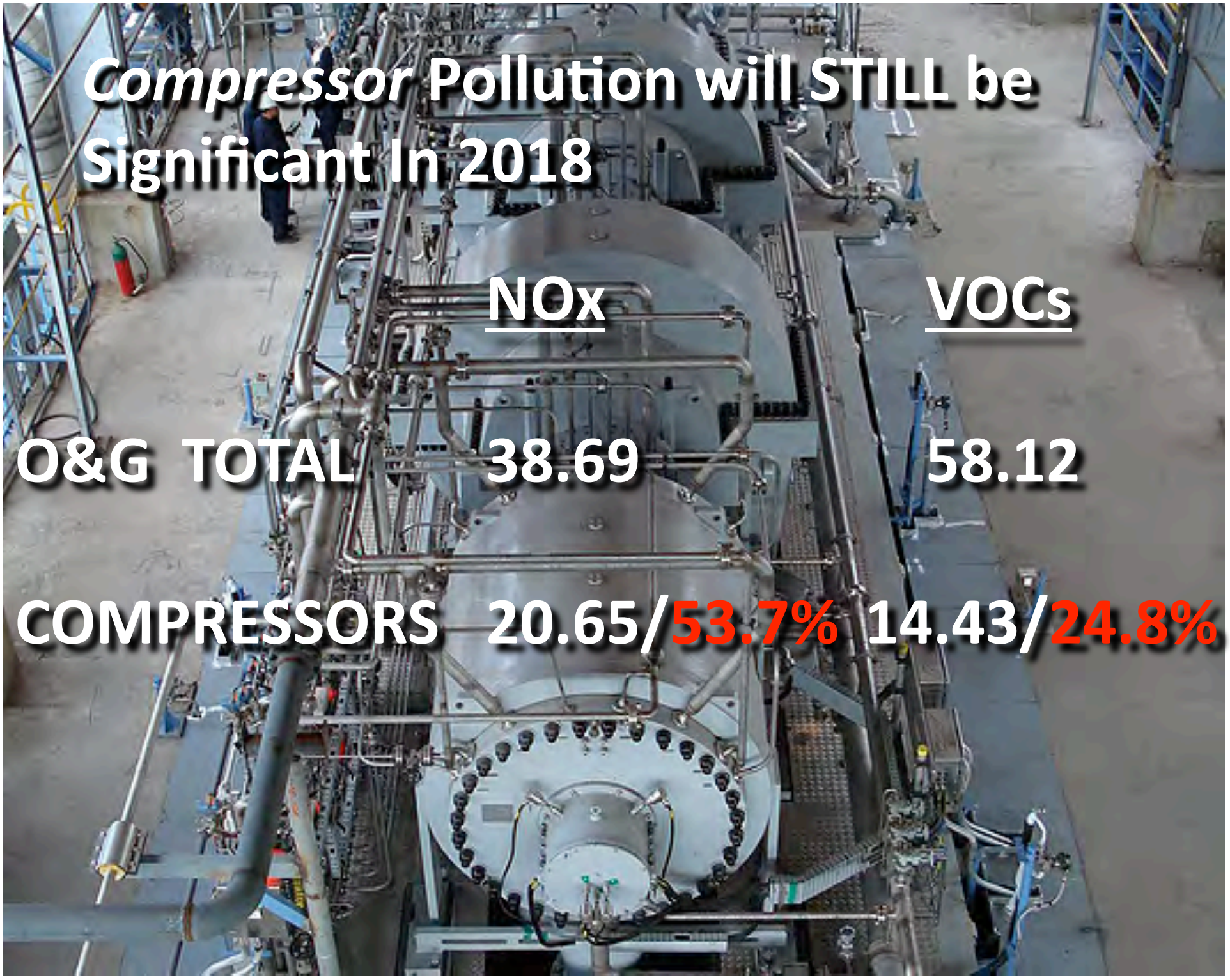
Source Category	NOX tpd	VOCs tpd	% NOX	% VOCs
On road	113.21	55.61	39.02%	11.87%
Oil and Gas	**38.69**	**58.12**	13.34%	12.40%
Non Road	39.87	32.77	13.74%	6.99%
Locomotives	18.90	.93	6.51%	.198%
Area	16.46	284.39	5.67%	60.69%
Airports/ Ground	11.77	3.53	4.06%	.75%
Cement Kilns	17.60	.80	6.07%	.17%
EGUs	15.02	2.05	5.17%	.44%
Other Point	10.65	30.36	3.67%	6.48%

Compressor Pollution is Significant

According to TCEQ, there are 647 large Compressor engines in DFW's Non-attainment Area

There are unknown thousands of smaller compressor engines


All in the Western half of DFW…… where the most stubborn monitors are


Compressor Pollution will STILL be Significant In 2018
NOx
VOCs
O&G TOTAL 38.69 58.12
COMPRESSORS 20.65/53.7% 14.43/24.8%

A Single Large Compressor Station Can Impact Local Ozone Levels Significantly

Journal of the Air & Waste Management Association
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uawm20

The potential near-source ozone impacts of upstream oil and gas industry emissions

Eduardo P. Olaguer [a]
[a] Houston Advanced Research Center, The Woodlands, Texas, USA

Accepted author version posted online: 29 May 2012. Version of record first published: 18 Jul 2012

"Routine emissions from a single gas compressor station or large flare can raise ozone levels by 3 parts per billion as far as five miles downwind, and sometimes by 10 ppb or more as far as 10 miles downwind."

Much Less 647 of them....

Journal of the Air & Waste Management Association
Publication details, including instructions for authors and subscription information:
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"Given the possible impact of large single facilities, it is all the more conceivable that aggregations of oil and gas sites may act in concert so that they contribute several parts per billion to 8-hr ozone during actual exceedances ."

Emissions Can Be Large Enough to Prevent DFW attainment

Journal of the Air & Waste Management Association
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uawm20

The potential near-source ozone impacts of upstream oil and gas industry emissions

Eduardo P. Olaguer [a]
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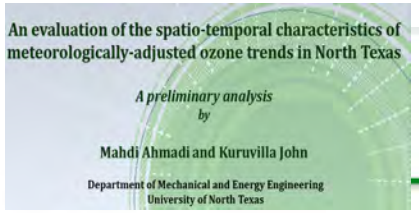
"Major metropolitan areas in or near shale formations will be hard pressed to demonstrate future attainment of the federal ozone standard, unless significant controls are placed on emissions from increased oil and gas exploration and production....urban drilling and the associated growth in industry emissions may be sufficient to keep the area in nonattainment."

"...may be sufficient to keep the area in nonattainment."

2014 UNT Study: O&G Effects on Monitors



Monitoring Sites

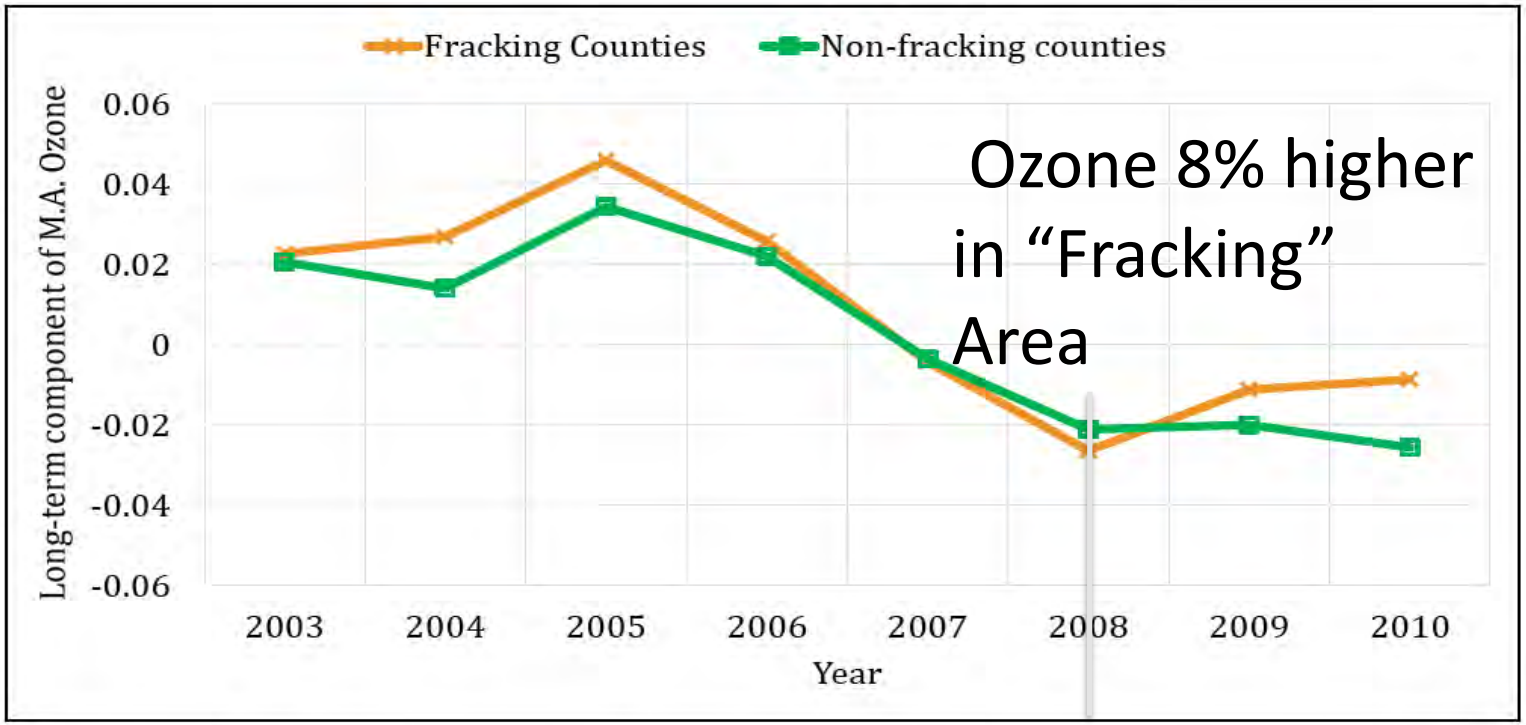
CAMS #	Name	County	Parameters	No. of wells - 10 mi
C76	Parker County	Parker	O_3, SR, T, W	158
C73	Granbury	Hood	O_3, SR, T, W	428
C75 ■	Eagle Mountain	Tarrant	O_3, SR, T, W	2723
C77	Cleburne Airport	Johnson	O_3, SR, T, W	1474
C13	Ft. Worth Northwest	Tarrant	O_3, SR, T, RH, W	1092
C17 ■	Keller	Tarrant	O_3, SR, T, W	1364
C56 ■	Denton Municipal Airport	Denton	O_3, SR, T, RH, W	1362
C61	Arlington Muni. Airport	Tarrant	O_3, SR, T, W	862
C70 ■	Grapevine Fairway	Grapevine	O_3, SR, T, RH, W	299
C402	Dallas Executive Airport	Dallas	O_3, T, W	1
C60	Dallas Hinton St.	Dallas	O_3, SR, T, RH, W	2
C63	Dallas North No. 2	Dallas	O_3, SR, T, W	2
C31	Frisco	Collin	O_3, SR, T, W	0
C69	Rockwall Heat	Rockwall	O_3, SR, T, W	0
C71	Kaufman	Kaufman	O_3, SR, T, RH, W	0
C1006	Greenville	Hunt	O_3, SR, T, W	0

"Fracking region" (FR)

"Non-fracking region" (NFR)

Results – Part II

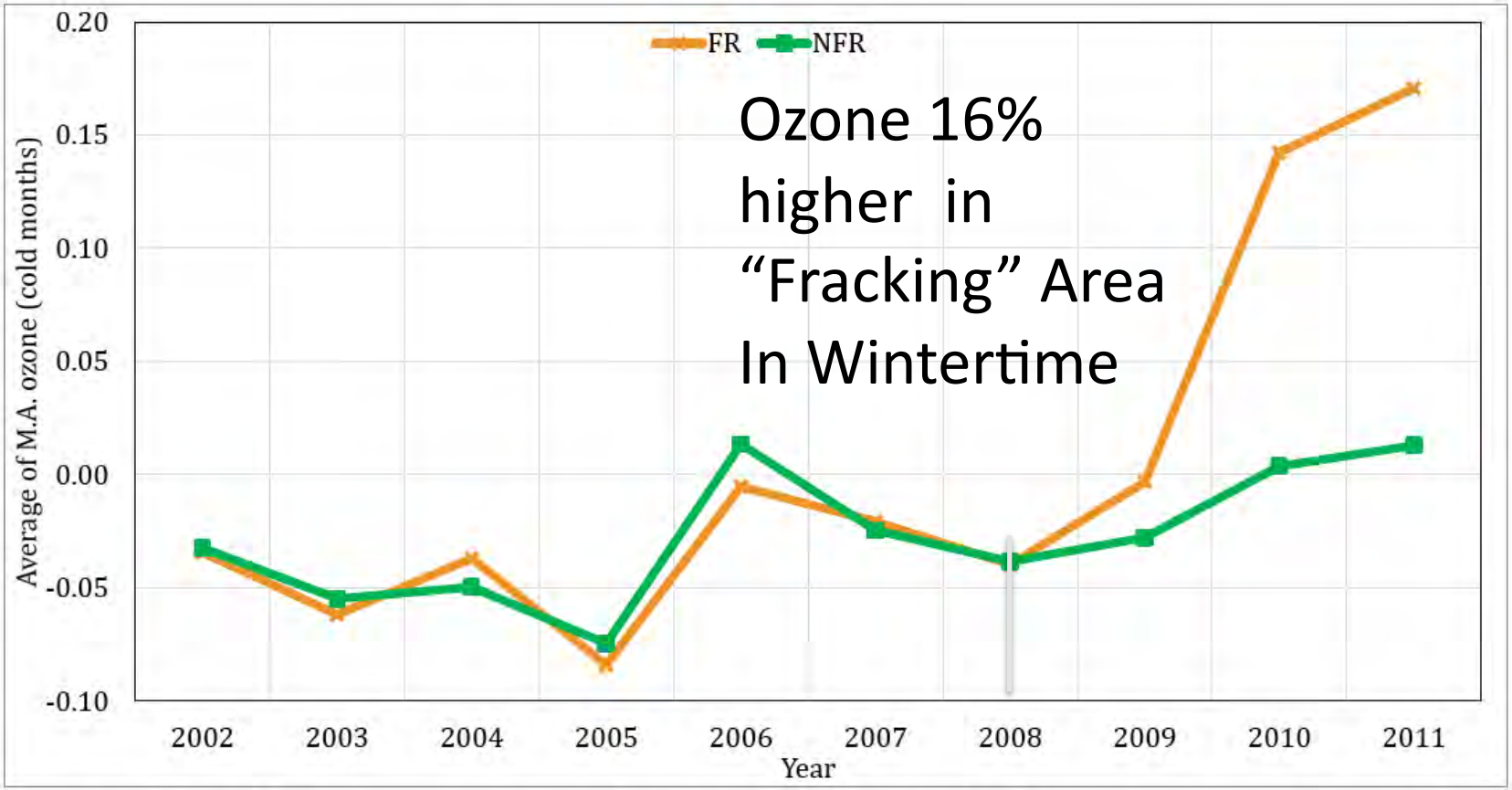
- Mean values of long-term component of $O_{MA}(t)$ (that is devoid of meteorological influence)



- $O_{MA}(t) \times 100$ values represent change in mean value of the original ozone time series

Results – Part II

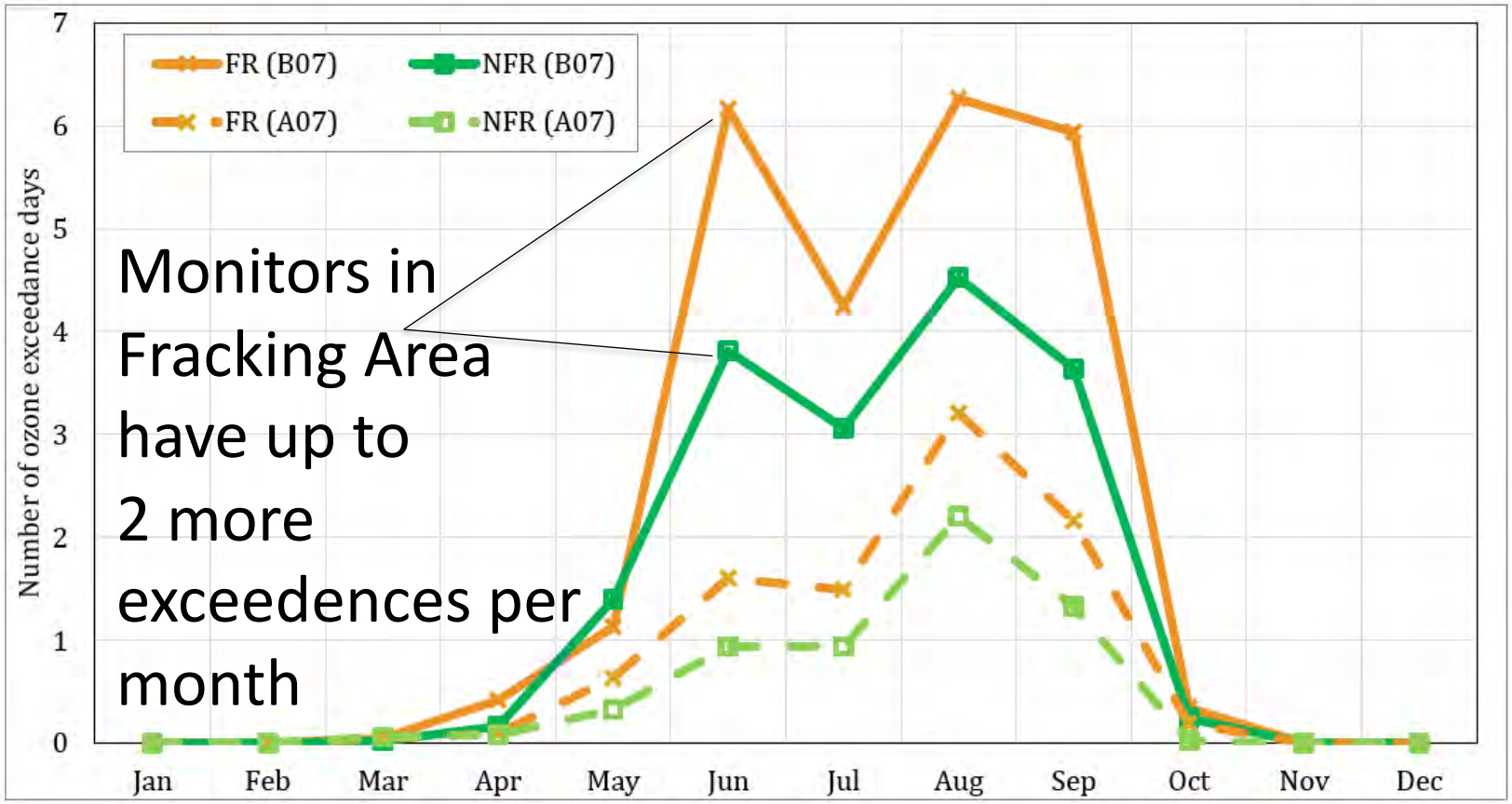
- Mean values of $O_{\mathrm{MA}}(t)$ in **FR** and **NFR** during winter time (Nov, Dec, Jan, Feb)



- $O_{\mathrm{MA}}(t) \times 100$ values represent change in mean value of the original ozone time series

Results – Part I

- Number of average ozone exceedance days by month (> 75 ppb)



2018 Compressor Pollution Estimates

	2006	2011	2012	2018 est
NOx	48.8	28.44	42.3	20.65
VOCs	5.49	7.7	3.6	14.44
TOTAL	33.93	36.14	45.9	35.09

2018 SIP: Compressors Pollution Going Up or Down?

TCEQ: Number of Compressors" tied to **Production Rates – Production Rates declining**

Industry: Number of compressors tiled to **number of wells – Number of wells increasing**

*2013 Rand Study: "**Most emissions are related to ongoing activities, i.e., gas production and compression**, which can be expected to persist beyond initial development and which are largely unrelated to the unconventional nature of the resource."*

And older plays need more compressors

Thus the decline of the wells reduces the capacity of the compressing station and necessitates the installation of more compressors as the field grows older.

g+1 0

0 Reviews
Write review

Necessary Use and Effect of Gas Compressors on Natural Gas Field Operating ...
By Samuel S. Wyer

Now, What can be done to improve
the flow rate?
Which can be changed easiest, quickest and cheapest? (Some are as easy as a choke change or **adding a compressor**.)

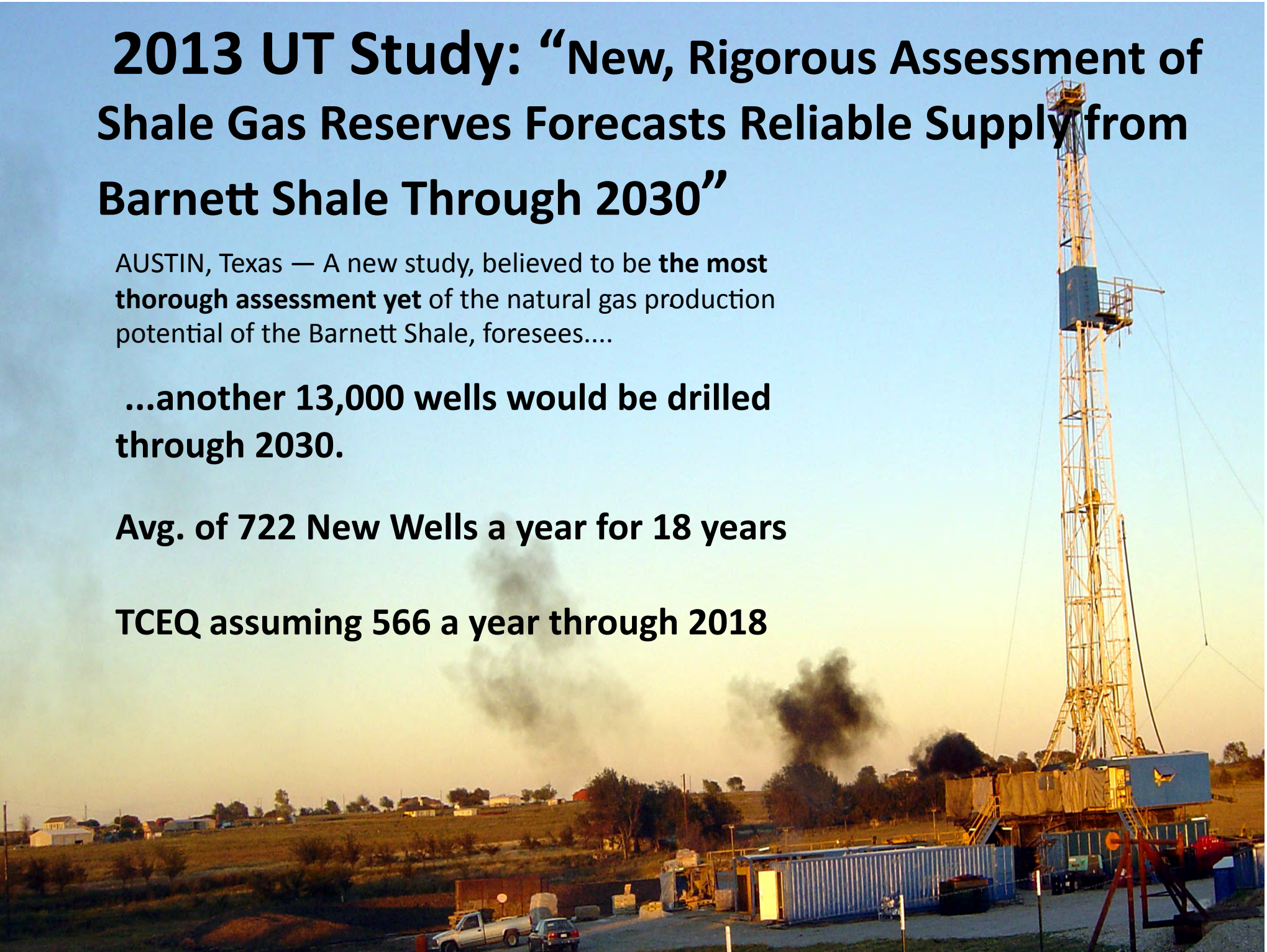
George E. King Engineering

GasJack™ Compressors

In today's competitive arena, GasJack™ compressors have enabled operators and owners to dramatically increase production, thereby extending the economic life and recoverable reserves of their properties. As the manufacturers of the GasJack™ compressor, Compressco provides service and support to the Petroleum and Natural Gas industries.

Whether your needs are increasing reserve recovery on older, marginal gas wells producing from permeable formations, increasing fluid production, or used as the first stage compression on gathering systems, the GasJack offers a profitable solution to a variety of applications.

2013 UT Study: "New, Rigorous Assessment of Shale Gas Reserves Forecasts Reliable Supply from Barnett Shale Through 2030"

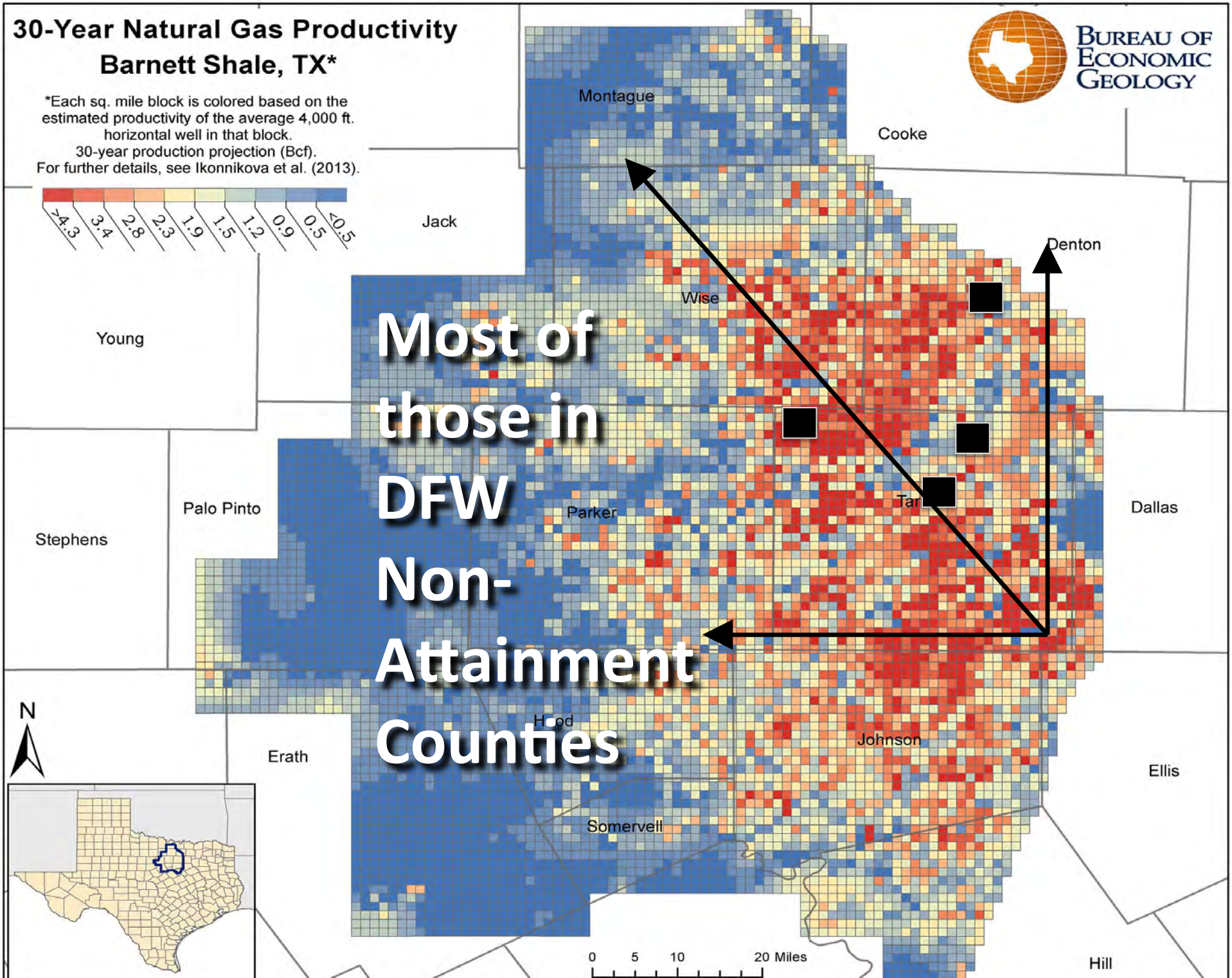


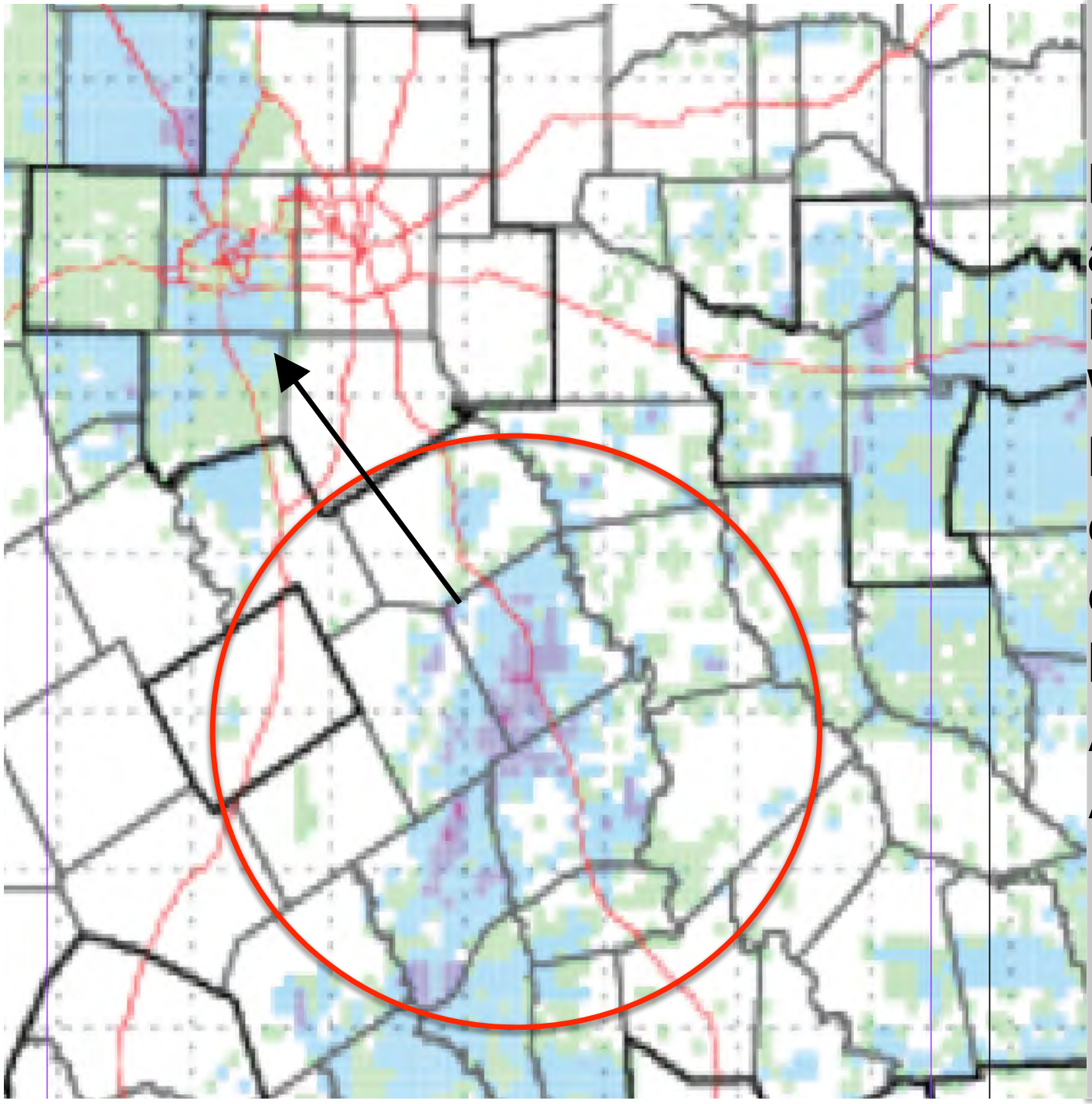
AUSTIN, Texas — A new study, believed to be **the most thorough assessment yet** of the natural gas production potential of the Barnett Shale, foresees....

...another 13,000 wells would be drilled through 2030.

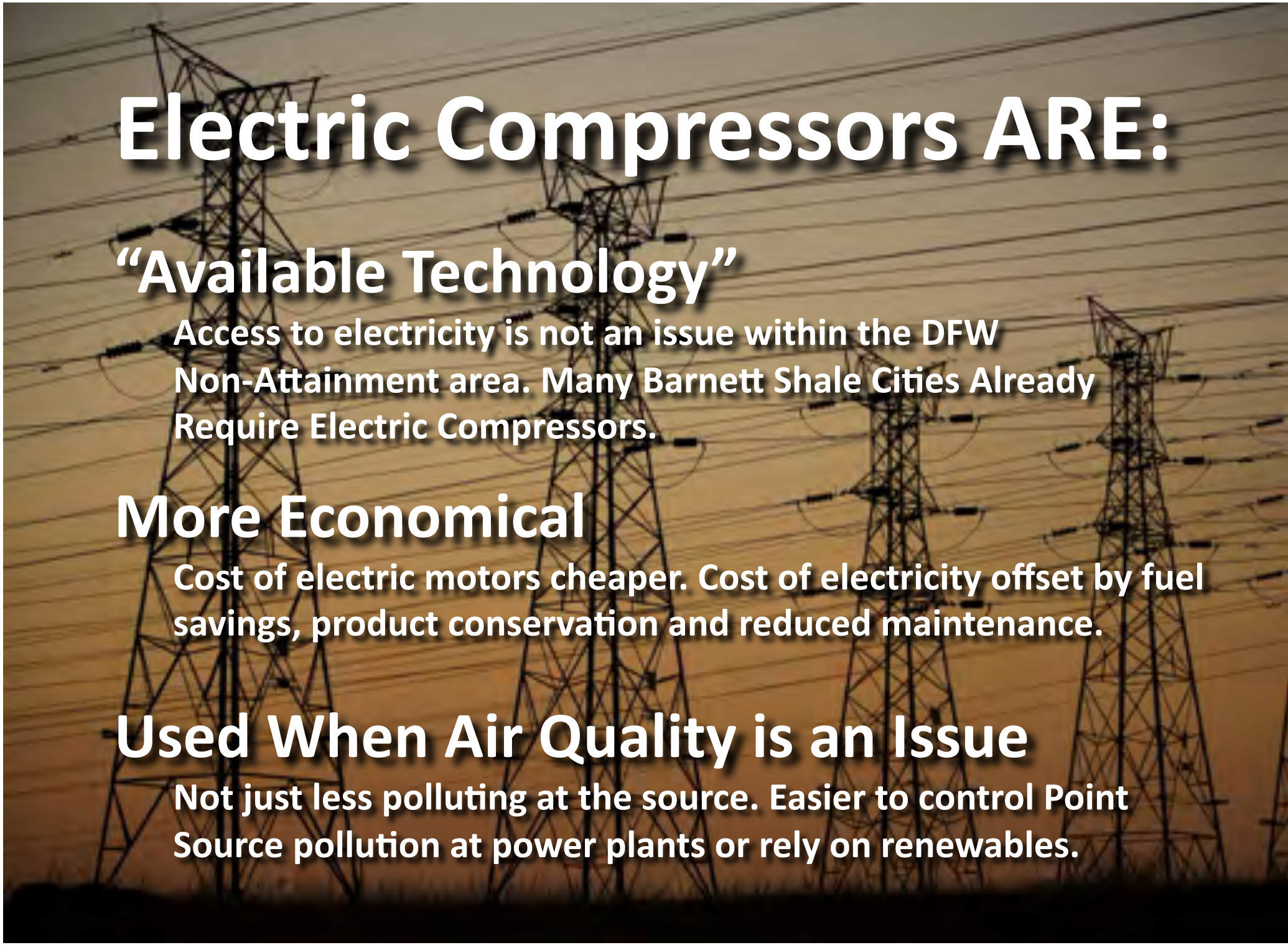
Avg. of 722 New Wells a year for 18 years

TCEQ assuming 566 a year through 2018


30-Year Natural Gas Productivity
Barnett Shale, TX*
*Each sq. mile block is colored based on the estimated productivity of the average 4,000 ft. horizontal well in that block.
30-year production projection (Bcf).
For further details, see Ikonnikova et al. (2013).
>4.3
3.4
2.8
2.3
1.9
1.5
1.2
0.9
0.5
<0.5
Bureau of Economic Geology
Montague
Cooke
Jack
Denton
Wise
Young
Most of those in DFW Non-Attainment Counties
Palo Pinto
Parker
Tar
Dallas
Stephens
N
Hood
Johnson
Erath
Ellis
Somervell
0 5 10 20 Miles
Hill



Not Just a Problem in DFW – We're Downwind of Thousands of Tons of New Oil And Gas Air Pollution


Electric Compressors ARE:
"Available Technology"
Access to electricity is not an issue within the DFW Non-Attainment area. Many Barnett Shale Cities Already Require Electric Compressors.
More Economical
Cost of electric motors cheaper. Cost of electricity offset by fuel savings, product conservation and reduced maintenance.
Used When Air Quality is an Issue
Not just less polluting at the source. Easier to control Point Source pollution at power plants or rely on renewables.

DFW Airport Ground Equipment Electrification Mandate Provides Precedent

In 1999, the State required owners and operators of airports in the DFW non-attainment area to reduce pollution from ground support equipment by 90%.

This rule was estimated to reduce NOx emissions by 6 tons per year in DFW.

Air Quality Impacts of Compressor Electrification

Over 50% of Oil and Gas NOx pollution cut
20.65 tons per day/7,537 tons a year

Almost 25% of Oil and Gas VOC pollution cut
14.3 tons per day/5,219 tons per year

Extending it to East Texas would cut another
135-250 tons per day/49-91,000 tons a year

Benefits DFW, Tyler-Longview, and Austin Non-Attainment Areas

Co-Benefits of Electric Compressors

Reductions in:

- **Particulate Matter**
- **VOCs**
- **Toxins**
- **Greenhouse Gases**

"Products of incomplete combustion include VOC's, CO, methane, and formaldehyde. Fuel bound sulfur will form Sulfur Dioxide in the combustion process. CO2 is the product of burning any type of hydrocarbons."

Gas Compressor Station Economic Optimization
Rainer Kurz, Matt Lubomirsky and Klaus Brun
International Journal of Rotating Machinery
Volume 2012 (2012)

Electrification of Compressors *IS* RACM:

Technologically Feasible?

Economically Feasible?

EPA must make TCEQ explain why electric Compressors are not being required in the 2018 SIP as "as expeditiously as practicable."

42 U.S. Code § 7502 - Nonattainment plan provisions in general

(c) **Nonattainment plan provisions** The plan provisions (including plan items) required to be submitted under this part shall comply with each of the following:

(1) In general **Such plan provisions shall provide for the implementation of ALL reasonably available control measures AS EXPEDITIOUSLY as practicable (including such reductions in emissions from EXISTING SOURCES in the area as may be obtained through the adoption, AT A MINIMUM, of reasonably available control technology) and shall provide for attainment of the national primary ambient air quality standards.**

RACM/RACT are Minimum requirements for SIPs.

They're not ceilings *restricting* the adoption of more stringent controls.

They're the foundation of *building* an effective SIP.

The ceiling is *proving attainment* of the national standard - something this SIP does not do.

2018 SIP: Deja Vu All Over Again?

FORT WORTH
Star-Telegram

Region's clean-air plan is flawed, engineer reports

Region's clean-air plan is flawed, engineer reports

By SCOTT STREATER
Star-Telegram staff writer
December 15th, 2007

The Dallas-Fort Worth area will never meet federal clean-air standards unless the state targets ozone-forming pollution from cement plants, natural gas compressor engines and other sources that affect Tarrant and Denton counties.

That's one of the findings in a new study by Al Armendariz, a Southern Methodist University chemical engineer who has advised local advocates on ozone issues. Armendariz analyzed ozone patterns over the past 10 years and found that pollution levels have remained the same or risen slightly in Tarrant and Denton counties as they decreased elsewhere.

He attributed this to the increase in compressor engines used to produce natural gas in the Barnett Shale and to the cement plants in Ellis County, southeast of Fort Worth.

Yet a state clean-air plan for the Dallas-Fort Worth region mostly focuses on pollution that affects Frisco, in Collin County, even though the highest ozone levels in the past five years have been recorded in Tarrant County.

"The DFW area will never meet federal clean air standards unless the state targets ozone-forming pollution from cement plants, natural gas compressor engines and other sources that affect Tarrant and Denton Counties."

“The photochemical modeling indicates the DFW area will attain the 1997 eight-hour ozone standard and additional control measures are not necessary for the area to demonstrate attainment by the attainment date.”


JUDGE
JUDY SHEINDLIN